APPLIED RESEARCH BRANCH

Strategic Policy

# Seasonality of Labour Markets
## Comparison of Canada, the U.S. and the Provinces

R-00-8E

by
Roger Guillemette, Francis L'Italien and Alex Grey

November 2000

Working Paper

Human Resources Development Canada
Développement des ressources humaines Canada

Canada

SP-457-09-01E

103-04888/

**Applied Research Branch**
**Strategic Policy**
**Human Resources Development Canada**

**Direction générale de la recherche appliquée**
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**Développement des ressources humaines Canada**

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Printed/Imprimé 2001
ISBN: 0-662-30102-1
Cat. No./N° de cat. MP32-29/00-8E

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# Abstract

Seasonal patterns have an important impact on the Canadian labour market. Seasonality leads to the underutilisation of both labour and capital resources. It also results in significant instability in employment and in incomes. Moreover, the differential impact of seasonality on regions leads to substantial disparities in labour markets and earnings across the country as well as significant interregional income re-distribution via both the Employment Insurance and Equalisation programs.

Employment seasonality, as measured by both seasonal amplitude and mean seasonal variation, is about double in Canada what it is in the United States. However it has declined significantly in both countries at approximately the same rate over 1976-1997. The reduction in employment seasonality is due both to a decline in the share of traditional seasonal industries in total employment and to a decline in the extent of employment seasonality within all industries.

Employment seasonality is widespread and it is not limited to traditionally seasonal sectors. While the primary sector and the construction industry are more seasonal than other sectors and industries, public administration shows a noticeable seasonal pattern, as does retail trade. In fact, over 55 per cent of total employment seasonality is accounted for by industries outside the primary sector and construction.

The timing of seasonal swings in employment is similar across provinces but their magnitude differs. Employment is much more seasonal in the Atlantic provinces. Higher employment seasonality appears to be principally attributable to greater seasonal fluctuations in employment in all broad industry groups in Atlantic Canada, rather than to differences in the industry mix of employment. However, this conclusion is tentative, since it is based on a highly aggregated analysis.

The high correlation between seasonal movements in the labour force and employment indicates that non-employed individuals tend to withdraw from the labour force during the off season. Seasonal swings in the labour force are somewhat smaller than those in employment. As a result, unemployment rises somewhat in periods of seasonally low employment. The tendency for seasonal workers not to leave the labour force is estimated to have added about 0.8 of a percentage point to the national unemployment rate in 1997. The impact is much larger in particular industries and provinces.

# Résumé

La saisonnalité a d'importantes répercussions sur le marché du travail canadien. Elle donne lieu à une sous-utilisation de la main-d'œuvre et des ressources en capital. Elle se traduit également par une instabilité importante de l'emploi et du revenu. De surcroît, comme ses effets sont différents selon les régions, ce phénomène entraîne des disparités substantielles dans les marchés du travail et la rémunération à l'échelle du pays, de même qu'une importante redistribution du revenu entre les régions par l'entremise du régime d'assurance-emploi et du programme de péréquation.

La saisonnalité de l'emploi, mesurée à la fois par l'amplitude et la moyenne des fluctuations saisonnières, est grosso modo deux fois plus importante au Canada qu'aux États-Unis. Toutefois, elle a beaucoup reculé dans les deux pays entre 1976 et 1997, et ce, à peu près au même rythme. Ce repli est attribuable à une diminution de la part de l'emploi total que représentent les industries saisonnières traditionnelles ainsi qu'à une réduction de la portée de la saisonnalité de l'emploi dans l'ensemble des secteurs d'activité.

La saisonnalité de l'emploi, qui est fort répandue, ne se limite pas aux secteurs saisonniers traditionnels. Même si le secteur primaire et l'industrie de la construction affichent une plus grande saisonnalité que d'autres secteurs et industries, l'administration publique montre elle aussi des tendances saisonnières significatives, tout comme le commerce de détail. En fait, plus de 55 % de la saisonnalité globale de l'emploi est attribuable à des industries qui n'appartiennent pas au secteur primaire ou à la construction.

Les fluctuations saisonnières se font généralement sentir au même moment dans les diverses provinces, mais leur ampleur varie. L'emploi est beaucoup plus saisonnier dans les provinces de l'Atlantique, ce qui semble s'expliquer principalement par des fluctuations saisonnières plus prononcées dans tous les grands groupes d'industries, plutôt que par des différences dans la composition de l'emploi selon les industries. Il s'agit là d'une conclusion provisoire, puisqu'elle s'inspire d'une analyse à un niveau de ventilation très agrégé.

La forte corrélation entre les mouvements saisonniers de la population active et ceux de l'emploi indique que les sans-emploi ont tendance à se retirer du marché du travail pendant la saison morte. Les fluctuations saisonnières de la population active sont moins amples que celles de l'emploi, de sorte que le chômage augmente légèrement pendant les périodes où l'emploi affiche un creux saisonnier. Selon certaines estimations, la tendance des travailleurs saisonniers à ne pas se retirer de la population active serait à l'origine d'une majoration de 0,8 point de pourcentage du taux national de chômage en 1997. Cet impact est beaucoup plus important dans certaines industries et dans certaines provinces.

# Acknowledgements

The authors are indebted to fellow staff of the Applied Research Branch, especially Louis Grignon, for their invaluable suggestions on content, to Richard Roy for coming up with the original idea for this paper, and to Marietta Morry of Statistics Canada for giving us relevant information on the way Labour Force Survey data are seasonally adjusted by Statistics Canada.

# Table of Contents

**1. Introduction** ..... 1

**2. Seasonality of employment** ..... 2

2.1 Measures ..... 2

2.1.1 A peak-trough measure of seasonality
2.1.2 Use of seasonal filtering techniques
2.1.3 Amplitude seasonality and mean season variation

2.2 Employment seasonality: A Canada-United States comparison ..... 8

2.2.1 Seasonal profile of employment
2.2.2 The evolution of employment seasonality

2.3 Seasonality of employment by sex ..... 12

2.4 Seasonality of employment by province ..... 13

2.4.1 Seasonality of employment by industry and province from 1976 to 1997
2.4.2 Employment seasonality by industry and province according to two components: intra and the inter-industry effects
2.4.3 Changes in employment seasonality by industry and province between 1976 and 1997

**3. Labour force seasonality and comparison with employment seasonality** ..... 26

3.1 Overview of labour force seasonality for Canada ..... 26

3.2 Labour force seasonality by sex ..... 27

3.3 Labour force seasonality by province ..... 28

3.3.1 Labour force seasonality by industry and province, 1976 to 1997
3.3.2 Labour force seasonality by industry and province according to two components: the intra and the inter-industry effects
3.3.3 Changes in the labour force seasonality by industry and province between 1976 and 1997

**4. Seasonality of the unemployment rate** ..... 38

4.1 Seasonal amplitude and mean seasonal variation of the unemployment rate ..... 38

4.2 What would the unemployment rate be if there were no seasonality? ..... 40

**5. Conclusions** ..... 44

Bibliography ..... 47

# 1. Introduction

Seasonal patterns have an important impact on the Canadian labour market. Economic activity and employment vary regularly over the year as a result of various factors such as weather, harvest times, school terms, tax-filing patterns, and Christmas shopping periods. In economic terms, a seasonal pattern is ***a sub-annual pattern in a time series that repeats itself more or less regularly year after year***. This paper analyses patterns of seasonality in the labour market using monthly data taken from Statistics Canada's Labour Force Survey.

Seasonality is an important issue for several reasons. At a very general level, economic theory argues that variability in production is less efficient than stable production. The principal cost of variable production is the need to keep labour and capital idle during the low season. There are also fixed costs associated with the process of stopping and restarting production. Since seasonality is a source of variation in production, it is therefore potentially costly in terms of a misallocation of labour resources. Seasonality of employment also results in instability of employment. This results in the need for workers to combine several jobs, often in different industries in order to be employed for the full year. Alternatively, the result may be dependence on public assistance programs, such as Employment Insurance (EI), on an annual basis for some proportion of the year. Finally, the differential impact of seasonality on regions leads to substantial disparities in labour markets and earnings across the country as well as significant interregional income re-distribution via both the EI and Equalisation programs.

This paper begins with a summary of various measures of seasonality, as they apply to employment. In the third section, it then proceeds to trace the potential impact of seasonality through the labour force. Section 4 considers to what extent the unemployment rate reflects patterns of seasonality. A concluding section briefly summarises the main results.

# 2. Seasonality of employment

This section discusses three measures of seasonality. An amplitude measure of seasonality as well as a measure of mean monthly variation due to seasonality were introduced in a document by Statistics Canada (1982). The third is a simple peak-trough measure of seasonality. Marshall (1999) has proposed alternative measures of employment seasonality. However, the measures proposed here and the measures of Marshall give essentially similar information about seasonality.

## 2.1 Measures

Movements in labour market variables can be broken down into four different components of which seasonality is one:

1) a long-term trend;

2) a monthly seasonal variation;

3) a cyclical component; and

4) a residual component.

The long-term trend is indicative of long-term growth in the absence of changes due to short-term labour market fluctuations and seasonal variations. The cyclical component is the contribution of changes in business conditions on employment levels; for instance, a recession will result in a decline in employment levels regardless of trends and seasonality. The seasonal variation component is a monthly or periodic indicator of the ups and downs in employment levels that occur more or less consistently within each year.

Figure 2.1 illustrates employment levels from Statistics Canada's Labour Force Survey (LFS) on a monthly basis for the provinces of Nova Scotia and New Brunswick. Also shown are the long-term trends.[1] The most striking feature is the seasonal variation in employment around the trend

[1] Long-term trends are estimated using the Hodrick-Prescott filter, which is a smoothing technique used for removing both seasonal and cyclical effects from time series data. A smoothing parameter is used to control for variations in the filtered series relative to the variations in the original data. The greater the value of this parameter, the more the filtered series will follow a straight line. Using our judgement, a value of 25,000 was chosen to properly correct for unemployment rate cycles.

line. The trend in employment gives each series its upward thrust. In order to assess variations due to seasonality, as opposed to trend and cyclical effects, we must measure seasonality net of the other effects as we shall see in the following sections.

The annual highs and lows of seasonal labour market data shown above tend to occur in similar months from one year to the next. For Canada the trough in employment occurs consistently in January while the high is in July. This is shown in Figure 2.2, where the monthly employment levels have been averaged over a 21-year period. Since the underlying trend in employment data explains some of the sub-annual increase in employment levels, a measurement of a seasonal pattern in this data should first net out the effects of the trend.

Figure 2.1
**Employment in selected provinces**

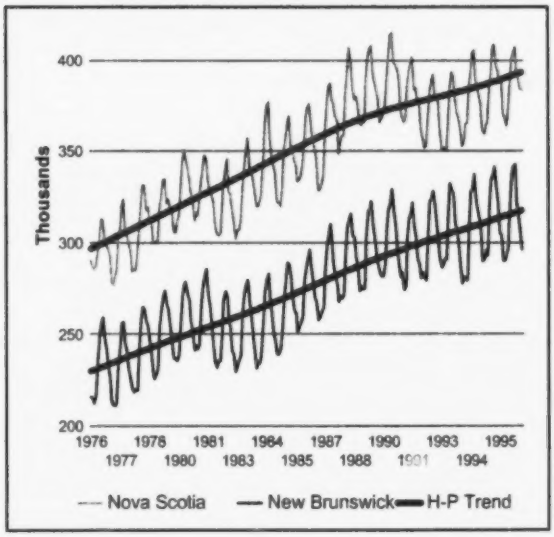
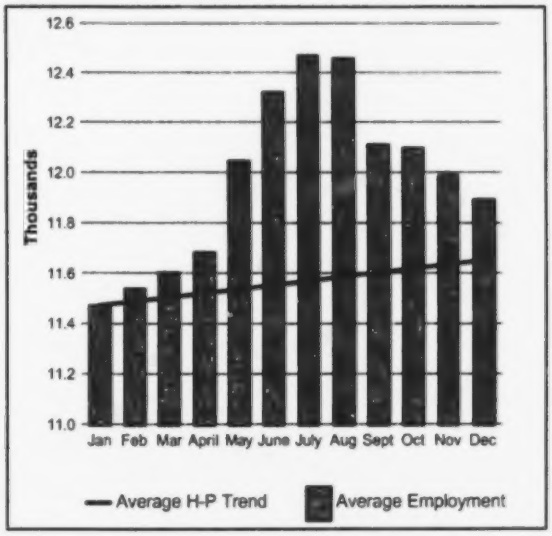



Figure 2.2
**Average monthly employment levels**
Canada, 1976-1996




### 2.1.1 A peak-trough measure of seasonality

A simple measure of seasonality compares employment at the seasonal peak to that at the seasonal trough [Atlantic Canada Opportunities Agency (1994)]. This is a measure of the amplitude of seasonality. The peak-trough index is constructed as the excess of the peak 2-month average employment level relative to the lowest 2-month average and is shown for Canada in Table 2.1. It relies upon the fact that employment tends to follow a consistent seasonal pattern each year, reaching a seasonal peak each summer, in the months of July and August, and then

declining to a trough in the months of January and February. The percentage levels on the right side of the table represent peak-trough seasonality estimates for 5 selected years. The average level of employment seasonality between 1976-1997 was 8.3 per cent. In other words, the bi-monthly peak employment levels for Canada are on average 8 per cent higher than the bi-monthly employment lows. According to the peak-trough index, the seasonal fluctuation in employment has declined as a proportion of employment. One shortcoming of the peak-trough index is that it does not incorporate the extent of seasonality in the excluded months. Another limitation is that it does not entirely filter out trend effects, which occur between the peak and trough months of the data.

Table 2.1
**Bi-monthly employment and peak-trough seasonality, Canada, selected years**

| | Employment level | | | | | | Peak-trough seasonality |
|---|---|---|---|---|---|---|---|
| | *Jan/Feb* | *Mar/Apr* | *May/June* | *July/Aug* | *Sept/Oct* | *Nov/Dec* | |
| 1976 | 9,339 | 9,468 | 9,931 | 10,284 | 9,884 | 9,751 | 10.1% |
| 1981 | 10,957 | 11,109 | 11,652 | 11,958 | 11,485 | 11,227 | 9.1% |
| 1986 | 11,652 | 11,811 | 12,319 | 12,549 | 12,194 | 12,043 | 7.7% |
| 1991 | 12,516 | 12,622 | 13,171 | 13,381 | 13,036 | 12,772 | 6.9% |
| 1997 | 13,359 | 13,535 | 14,176 | 14,438 | 14,140 | 13,995 | 8.1% |
| Averages | 11,588 | 11,729 | 12,274 | 12,552 | 12,197 | 12,034 | 8.3% |

### 2.1.2 Use of seasonal filtering techniques

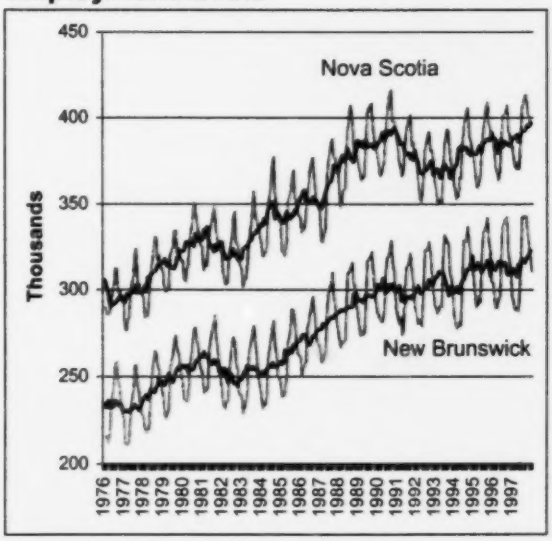
More complex measures of seasonality make use of special techniques developed by statistical agencies to estimate monthly seasonal variations in time series. These techniques are used to produce statistics that are said to be ***seasonally adjusted***, which in general terms indicate how many employed persons there would have been in a given month if usual monthly seasonal variations were netted out. The entire seasonal adjustment process differentiates between seasonal, cyclical and irregular movements in a series over a number of years on the basis of past movements.

The seasonal adjustment method used by Statistics Canada for labour force time series is the X-11-ARIMA method [Dagum (1980)]. This technique consists basically of:

1) modelling selected labour force time series by ARIMA models;[2]
2) extending each unadjusted time series by one year at each end through extrapolation; and
3) seasonally adjusting the extended series with various moving average techniques (known as X-11 techniques) that estimate the trend-cycle and the seasonal component.

Seasonal adjustment techniques are used to produce moving averages which, when averaged to annual levels, will result in the same average as the mean of the actual unadjusted data. These techniques therefore show how an indicator has progressed over recent months and years net of usual monthly seasonal fluctuations. The historic series of seasonally adjusted data is revised annually by incorporating the most recent information on changes in seasonality.[3] Thus seasonally adjusted data provided by Statistics Canada are re-adjusted annually to determine the best fit of the past data and to determine new adjustment factors to be used to make seasonally adjusted estimates for the following year.

Figure 2.3
**Seasonally adjusted and unadjusted employment levels**




Estimates of employment and the labour force are seasonally adjusted, using separate seasonal adjustment factors. Seasonally adjusted employment has been adjusted according to the trends and cycles in the previous years of employment data to eliminate only the effect of monthly seasonal variations. The same is true for the labour force. Figure 2.3 compares actual and seasonally adjusted employment levels in Nova Scotia and New Brunswick to show how the adjustment process corrects for sub-annual variations due to seasonality. The two adjusted series are much smoother than the unadjusted data but they continue to have the same general trend and cyclical effects as the original series. In

[2] ARIMA is an acronym for Autoregressive Integrated Moving Averages, see Box and Jenkins (1970) for a more detailed description.

[3] From "Section C: Notes on the Survey" in *The Labour Force*, Statistics Canada Catalogue 71-001.

order to ensure consistent time-series, seasonally adjusted unemployment is calculated as the residual of seasonally adjusted labour force less seasonally adjusted employment.

### 2.1.3 Amplitude seasonality and mean season variation

Statistics Canada (1982) describes several measures of seasonality that are derived from seasonally adjusted data. The two principal measures, ***seasonal amplitude*** and the ***mean seasonal variation (MSV)***, are calculated by comparing monthly seasonally adjusted data with actual levels. [See Statistics Canada (1982) for more details on the measures of seasonality described in the remainder of this section.]

One obvious advantage of this approach as compared to the peak-trough seasonality index is that the use of adjusted data removes the effects of trend and cyclical components in the original unadjusted time series.

The derivation of both these indicators is shown in Table 2.2 using 1976 employment levels for Canada.[4] The first 2 columns show monthly actual and seasonally adjusted employment levels as provided by Statistics Canada. The derivation of seasonal ratios, presented in the third column is straightforward — these are used in computing both indicators of seasonality. Seasonal amplitude, is the difference between the lowest and highest monthly seasonal ratios for the year, expressed as a percentage, given here as 96.9 per cent in January and 103.2 per cent in July. Thus, Canada's seasonal ratios of employment had a 6.3 percentage point range in 1997 – or seasonal amplitude – between the July peak and the January trough. This measure varies according to the same peaks and troughs used for measuring the simple ratio. The main difference is that amplitude seasonality removes any trend or multi-year cycle, which may exist in the unadjusted data used in the simple ratio. While seasonal amplitude gives a good picture of the magnitude of seasonal volatility in employment, it ignores seasonal variation in the remainder of the year.

[4] Another approach to analysing seasonality from the Statistics Canada study is to use the difference between unadjusted and adjusted data rather than the ratio. This approach leads to an amplitude indicator that varies more in terms of employment size than in relative terms and which is difficult to compare between regions.

The ***mean seasonal variation*** addresses this concern by using all twelve months of unadjusted and adjusted time series data for each year. This index is calculated by first deriving the absolute difference or variation between each monthly seasonal ratio and a reference level of 100 per cent. The resulting differences are then averaged to determine the mean variation of the seasonal ratios, or the MSV. Table 2.2 gives the absolute difference between each monthly seasonal ratio and 100 per cent in the rightmost column. These differences range from a low of 0.4 per cent in November, when seasonal variation is at its lowest, to a high of 3.2 per cent in July, where the effect of seasonal adjustment is greatest. The average of all 12 absolute differences gives a mean seasonal variation of 1.9 per cent for total Canadian employment in 1976.

Table 2.2
**Derivation of amplitude seasonality and mean seasonal variation of employment, Canada, 1997**

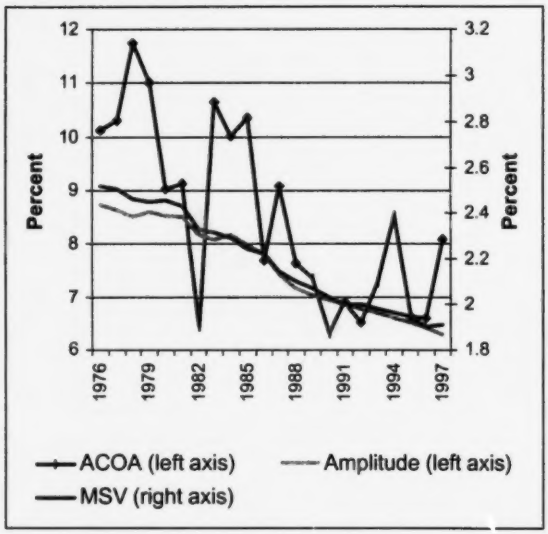
| | Employment (thousands) | | Seasonal ratios (Actual/Seasonally adjusted) | Difference from 100% (Absolute value) |
|---|---|---|---|---|
| | *Actual* | *Adjusted* | | |
| January | 13,342 | 13,764 | 96.9% | 3.1% |
| February | 13,376 | 13,749 | 97.3% | 2.7% |
| March | 13,487 | 13,809 | 97.7% | 2.3% |
| April | 13,584 | 13,843 | 98.1% | 1.9% |
| May | 14,003 | 13,894 | 100.8% | 0.8% |
| June | 14,349 | 13,942 | 102.9% | 2.9% |
| July | 14,419 | 13,970 | 103.2% | 3.2% |
| August | 14,458 | 14,023 | 103.1% | 3.1% |
| September | 14,174 | 14,030 | 101.0% | 1.0% |
| October | 14,106 | 14,030 | 100.5% | 0.5% |
| November | 14,010 | 14,066 | 99.6% | 0.4% |
| December | 13,979 | 14,115 | 99.0% | 1.0% |
| Lowest Ratio | | | 96.9% | |
| Highest Ratio | | | 103.2% | |
| Amplitude seasonality (Highest – Lowest) | | | 6.3% | |
| Mean seasonal variation (average of "Difference from 100%") | | | | 1.9% |

Figure 2.4 compares the three seasonality measures we have reviewed so far.[5] The following observations summarise the differences between these measures:

[5] Several additional measures of seasonality have been described in the literature. Pindyck and Rubinfeld (1991) suggest a seasonal adjustment formula whereby each monthly employment observation is divided by the 12-month moving average employment level centred on that month. The resulting "seasonally adjusted" series is then averaged over each of the 12 months to arrive at a measure of seasonality for each month. Going one step further with this indicator one could produce a ratio of high and low months to arrive at a seasonality index similar to the simple peak-trough measure. Another approach is to make use of seasonal dummy variables in a multivariate analysis. The measured coefficients on these variables give an estimated impact of seasonality.

1) Both amplitude measures are by definition consistently higher because they measure the magnitude of the seasonal swing in employment or volatility in employment. By contrast, the mean seasonal variation measures the average monthly deviation of employment from its non-seasonal level.

Figure 2.4
**Employment seasonality**
Canada, 1976-1997




2) The simple peak-trough measure is the most volatile of the three, as it is computed using actual data in which the effects of trend and cycle have not been netted out. This results in seasonality levels that are on the whole higher — since the overall employment trend rises more often than it falls.[6]

3) Overall, all three indicators point to a decline in employment seasonality. However, volatility in the simple peak-trough measure obscures this decline somewhat.

4) After adjusting for the scale, as in Figure 2.4, amplitude seasonality and mean seasonal variation track each other very closely. In other words, the decline in seasonal volatility is similar to the decline in how much actual employment deviates from its non-seasonal level in an average month.

## 2.2 Employment seasonality: A Canada-United States comparison

This portion of the paper compares employment seasonality in Canada and in the United States.[7] It starts by examining the typical seasonal profile of employment through the year. It next

[6] One example of cyclical effect in the simple peak-trough measure of seasonality occurs in 1982. The recession in that year leads to a much lower employment peak in July than the peaks of previous years, thereby resulting in a reduced ratio of peak-to-trough employment for that year.

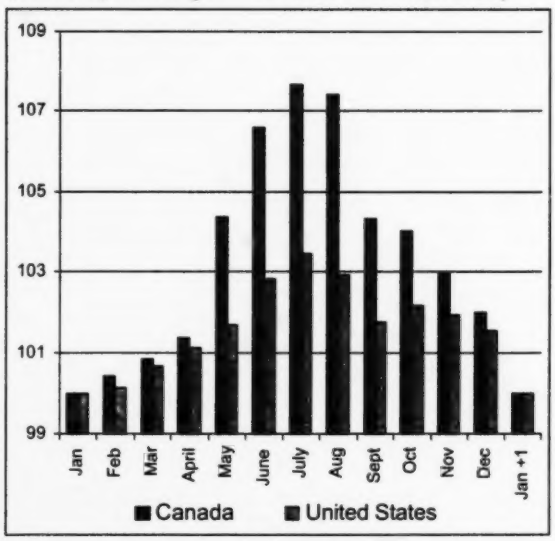
[7] This comparison is done using monthly figures from the Statistics Canada Labour Force Survey, which covers the population aged 15 years and over, and data for the United States from the Bureau of Labour Statistics, Current Population Survey, for persons 16 years and over.

compares the importance of employment seasonality in the two countries, and if it has changed over time.

### 2.2.1 Seasonal profile of employment

In the United States, as in Canada, employment betrays a marked seasonal profile. As can be seen from Figure 2.5, employment tends to reach its annual trough and peak at about the same time in both countries. This figure shows the average employment for each month of the year, over the period 1976-1997, in the form of an index. The use of a long-term average eliminates cyclical effects. The trend effect has been eliminated as well. This approach provides an overview of the seasonal profile of employment during the course of a typical year.

Figure 2.5
**Average monthly employment levels**
Canada and the United States, 1976–1997
(January average = 100; trend eliminated)




The seasonal pattern of employment peaks in July in both countries, after reaching a trough in January. Yet unlike Canada, the United States has a second, local employment peak in October, following a sharp decline in September when students return to school from summer jobs.

Figure 2.5 shows that the amplitude of seasonal employment swings, i.e. the difference between employment levels in January and during the summer months, is much greater in Canada than in the United States. For example, in Canada, the average for July is 107.7, after adjustment, while in the United States it is 103.5. According to this estimate, the seasonal amplitude of employment was on average more than twice as great in Canada as in the United States over the entire period 1976-1997.

### 2.2.2 The evolution of employment seasonality

We are also interested in seeing whether employment seasonality has increased or diminished over time, and how similar these movements have been in the two countries. Figures 2.6a and 2.6b

compare actual and seasonally adjusted monthly employment data for Canada and United States. These data have been transformed to make them comparable by setting the average for the period 1986-1987 at 100.

These graphs also make clear that the seasonal nature of employment is proportionally much more significant in Canada than in United States for the entire period 1976-1997, i.e. actual monthly employment shows a higher amplitude of seasonal swings in Canada than in the United States throughout the period. Yet it is difficult to determine, from Figures 2.6A and 2.6B, whether employment seasonality has increased or diminished in either country.

Figure 2.6A
**Employment, Canada, 1976-1997**
(1986-1987 average = 100)

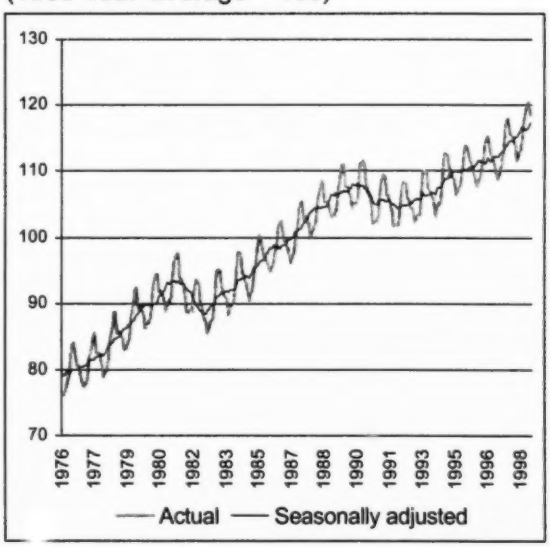
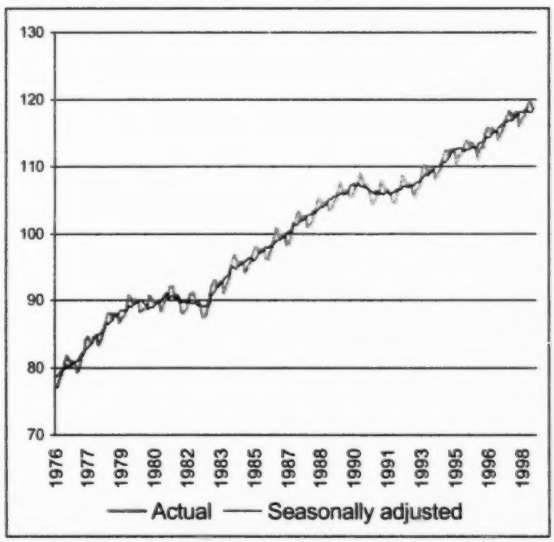



Figure 2.6B
**Employment, United States, 1976-1997**
(1986-1987 average = 100)




To add precision to the analysis of the evolution of employment seasonality in Canada and United States, we resort again to the measures of seasonal amplitude and mean seasonal variation of employment.

Figure 2.7 shows that the seasonal amplitude of employment declined over the period 1976-1997 in both the United States and Canada. Marshall (1999) also recorded a decline in the seasonality of total employment in Canada. The seasonal amplitude in Canada declined steadily from 8.7 per cent in 1976 to 6.3 per cent in 1997. However, the downward trend was temporarily interrupted in 1979 and in 1984. In the United States, the measure dropped from about 4 per cent in 1976 to

close to 3 per cent in 1997. Moreover, throughout his period, the seasonal nature of employment remained slightly more than twice as high in Canada as in United States: the ratio was 2.2 in 1976 and 2.1 in 1997. This means that the seasonal amplitude in the two countries declined by roughly the same proportion during this period, implying that the absolute decline has been greater in Canada, given the greater prevalence of seasonal employment in this country.

The results for mean seasonal variation confirm that as a proportion of total employment, seasonal swings were much more pronounced in Canada than in the United States throughout the period 1976-1997 (Figure 2.8). In fact, according to this measurement, the seasonal component of employment was about 2.5 per cent of total employment in 1976 in Canada, while 20 years later it was around 1.9 per cent. The downward trend is nearly linear, except in 1979 when the mean seasonal variation rose slightly. In the United States over the same period, the mean seasonal variation fell from about 1.1 per cent to 0.7 per cent of total employment. Thus the mean seasonal variation of employment has declined proportionately more in United States: it was 2.4 times greater in Canada than in United States in 1976, and 2.8 times greater in 1997.

Several factors might explain the decline in seasonality of employment in both countries. For example, modernised production techniques and the shrinking importance of primary industries in

Figure 2.7
**Seasonal amplitude of employment**
Canada and the United States, 1976-1997

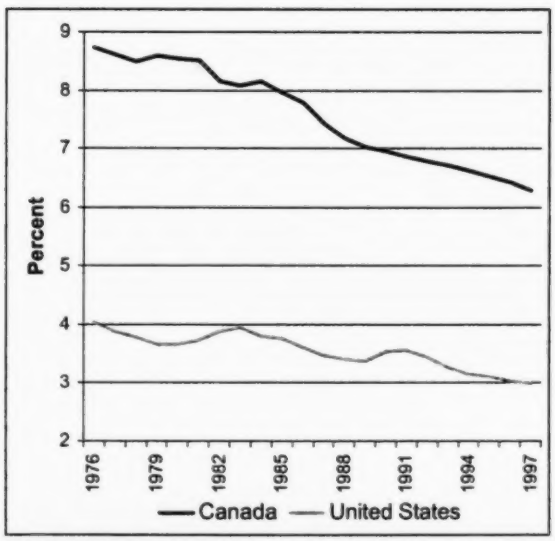
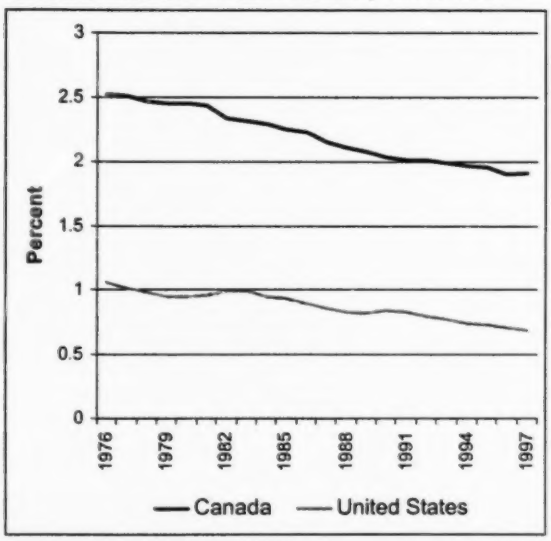



Figure 2.8
**Mean seasonal variation of employment,**
Canada and the United States, 1976-1997



favour of tertiary industries are probably the two major factors behind this decline. A shift-share analysis for Canada shows that the drop in the weight of the most highly seasonal industries in total employment accounts for 42 per cent of the decline in the seasonal amplitude of employment and 57 per cent of the decline in the mean seasonal variation. The reduction in the level of seasonality within each industry accounts for 54 per cent of the decline in seasonal amplitude and 68 per cent of that in the MSV. These results are discussed further in Tables 2.7a and 2.7b. Note that the sum of industry weighting changes and of movements within each industry is not equal to 100 per cent, because of the interaction effect and a residual component inherent in the seasonality measures used here.

## 2.3 Seasonality of employment by sex

Figures 2.9 and 2.10 compare employment seasonality for men and women. Regardless of the measure used, whether the seasonal amplitude of employment or its mean seasonal variation, it is clear that employment is much more seasonal for men than for women. The reason for this lies in the fact that a large proportion of seasonal jobs are in primary industries and in construction, where male employment predominates.

Figure 2.9
**Seasonal amplitude of employment**
By sex, Canada, 1976-1997

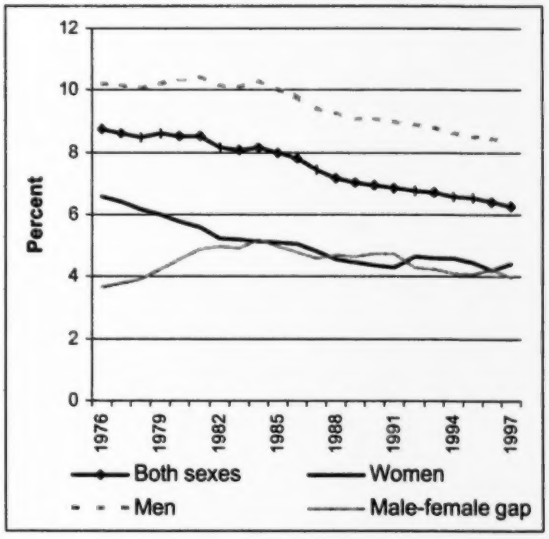
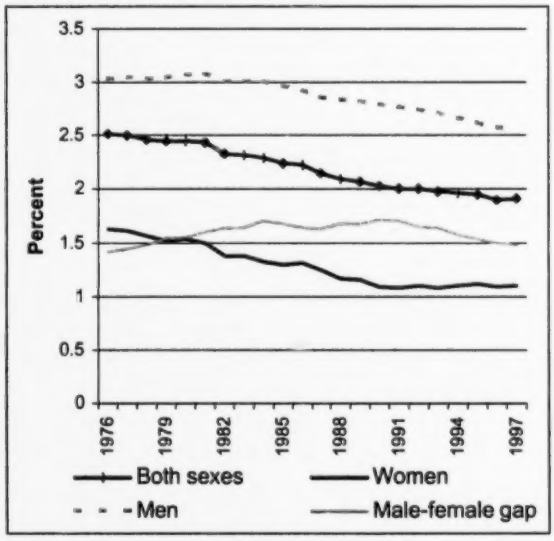



Figure 2.10
**Mean monthly seasonal variation of employment**
By sex, Canada, 1976-1997



While employment seasonality declined for both men and women between 1976 and 1997, the seasonality gap between the two sexes increased slightly, particularly between 1976 and 1981. The gap in seasonal amplitude of employment between males and females was 3.7 percentage points in 1976 (10.2 vs. 6.6), rising to 5.2 percentage points in 1984 (10.3 vs. 5.1), before declining to 4 percentage points (8.4 vs. 4.4) in 1997. A similar profile can be seen in the behaviour of the mean seasonal variation for men and women. The growing seasonality gap between male and female employment is explained by the proportionately greater decline in employment seasonality among women in certain years.

Figure 2.11
**Measures of employment sesonality**
Canada and Provinces, average, 1976 and 1997

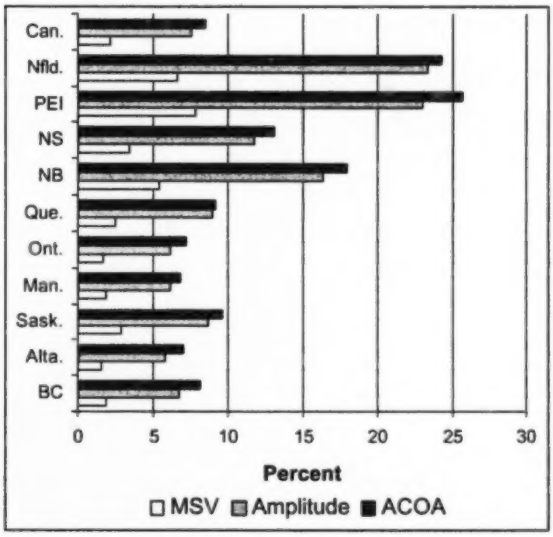



Table 2.3
**Ranking of average employment seasonality by province,**
average 1976-1997

| | *Peak-Trough* | *Amplitude* | *MSV* |
|---|---|---|---|
| Nfld. | 2 | 1 | 2 |
| PEI | 1 | 2 | 1 |
| NS | 4 | 4 | 4 |
| NB | 3 | 3 | 3 |
| Que. | 6 | 5 | 6 |
| Ont. | 8 | 8 | 9 |
| Man. | 10 | 9 | 7 |
| Sask. | 5 | 6 | 5 |
| Alta. | 9 | 10 | 10 |
| BC | 7 | 7 | 8 |

## 2.4 Seasonality of employment by province

This sub-section reviews how seasonality differs by province and how it has changed over time in provinces. A general comparison reveals that there are significant differences in seasonality across provinces. Despite these differences, the timing of seasonal swings in employment is similar across provinces. One measure, the average correlation of seasonal employment fluctuations among

provinces averaged to 0.96.[8] This means that inter-provincial differences in seasonality are a result of the magnitude of these swings. A review of the employment seasonality levels across provinces over 1976-1997 reveals some regional patterns (Figure 2.11 and Table 2.3).[9] Newfoundland and Prince Edward Island have the highest degrees of average seasonality, whereas seasonality is lowest in the provinces of Ontario, Manitoba, Alberta and British Columbia A rough classification of the extent of employment seasonality in each province reveals:

- ***very high seasonality:*** applies to Newfoundland and Prince Edward Island, with amplitude seasonality in excess of 20 per cent and with MSV's in excess of 6 per cent;
- ***high seasonality:*** applies to Nova Scotia and New Brunswick with amplitudes of over 10 per cent and MSV's over 3 per cent;
- ***moderate seasonality:*** for Quebec and Saskatchewan, the amplitude seasonality is greater than the national level and less than 10 per cent while the MSV lies between the national level and 3 per cent;
- ***low seasonality:*** the remaining four provinces have seasonality below the Canada level.

Figures 2.12 and 2.13 present a comparison of changes in the degree of seasonality for the years 1976 and 1997.[10] For Canada, as shown previously in Figure 2.4, seasonality, as measured by both seasonal amplitude and MSV declined between 1976-1997. There are significant declines in seasonality for 9 out of 10 provinces, with the largest drop for either indicator occurring in Saskatchewan and in Newfoundland. Newfoundland's amplitude dropped from 24.1 per cent to 19.5 per cent while in Saskatchewan the drop was greater at 5.1 percentage points — from 11.8 per cent in 1976 to 6.7 per cent in 1997. Newfoundland's mean ratio dropped from 7.4 per cent in 1976 to 5.7 per cent in 1997, while in Saskatchewan the comparable figures were 3.7 per cent and 2.4 per cent respectively. These two provinces were the only ones where the decline of seasonality was significantly greater than that of Canada.

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[8] This is based on an unweighted average of all provincial bivariate correlations of the monthly seasonal employment ratios, from 1976:01 to 1997:12.

[9] As mentioned earlier, the peak-trough measure is affected by the trend in employment which makes it greater than the seasonal amplitude of employment.

[10] Since the trend in ACOA seasonality is well captured by seasonal amplitude, this section focuses only on the two indicators of seasonality derived from seasonality adjusted data.

As mentioned at the beginning of this section, there is a significant linear trend underlying the two principal seasonality indicators for employment in Canada. A measure of this linear trend for Canada and each province is the correlation coefficient between seasonality levels and a simple linear time trend as shown in Table 2.4. The correlation coefficient between seasonality and the gap between actual and potential GDP in each region (Canada or province) measures whether employment seasonality exhibits a cyclical pattern.

Figure 2.12
**Seasonal amplitude of employment**
Canada and provinces, 1976 and 1997

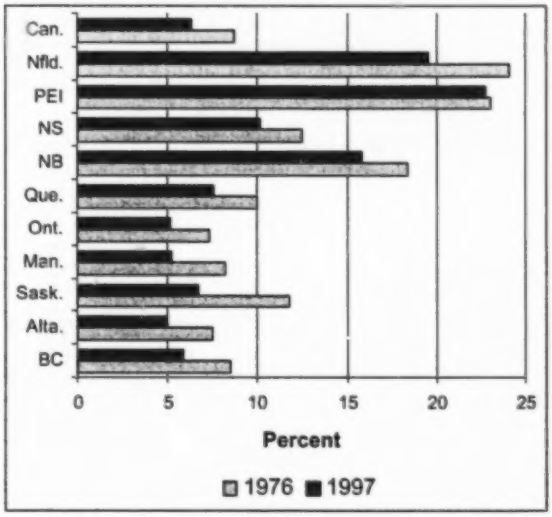
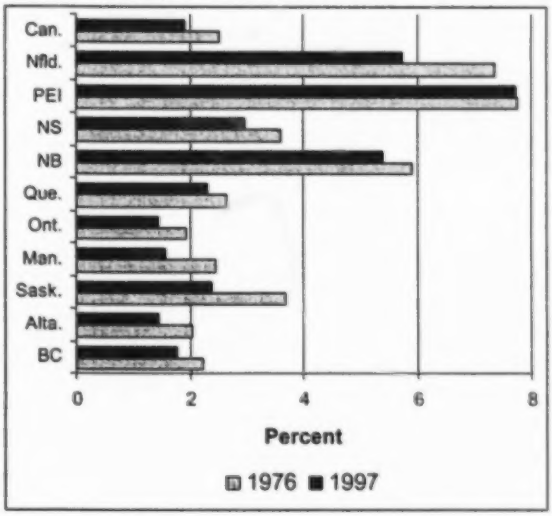



Figure 2.13
**Mean seasonal variation of employment**
Canada and provinces, 1976 and 1997




Seasonality has declined over time in almost all provinces as measured by the negative correlation coefficient between seasonality of employment and the time trend variable. The low correlation in Prince Edward Island (in absolute value) reflects relatively constant employment seasonality for that province over time. In general, seasonality is not associated with the cycle. In other words, the correlation coefficient between employment seasonality and the GDP gap is low. However, there is evidence of some correlation in Newfoundland Nova Scotia, New Brunswick and Saskatchewan.

As might be expected, the decline in seasonality nationally strongly reflects the declines in seasonality within the provinces. As shown in Table 2.5, the 2.46 per cent decline in amplitude seasonality in Canada was very strongly driven by changes in seasonality of employment within each province (2.5 per cent). Shifts in employment shares across provinces account for relatively

little of the decline. The intra-provincial effect is also very dominant in explaining the decline in MSV, while the inter-provincial and interaction effects account for about 12 per cent of the total decline in seasonality.

Table 2.4
**Correlation between employment seasonality levels and time trend or GDP gap, 1976-1997**

| | Amplitude seasonality | | Mean seasonal variation | |
|---|---|---|---|---|
| | *Time trend* | *GDP gap* | *Time trend* | *GDP gap* |
| Can. | -0.985 | 0.165 | -0.989 | 0.188 |
| Nfld. | -0.770 | 0.456 | -0.928 | 0.443 |
| PEI | 0.068 | 0.051 | 0.419 | 0.061 |
| NS | -0.838 | 0.318 | -0.740 | 0.394 |
| NB | -0.889 | -0.167 | -0.800 | 0.413 |
| Que. | -0.841 | -0.152 | -0.640 | -0.008 |
| Ont. | -0.939 | 0.020 | -0.923 | -0.003 |
| Man. | -0.930 | 0.196 | -0.938 | 0.198 |
| Sask. | -0.975 | 0.415 | -0.977 | 0.413 |
| Alta. | -0.945 | 0.215 | -0.850 | 0.039 |
| BC | -0.883 | 0.279 | -0.818 | 0.149 |

Table 2.5
**Decomposition of decline in employment seasonality levels for Canada by provincial seasonality effects, 1976-1997, shift-share analysis**

| | Amplitude seasonality | Mean seasonal variation |
|---|---|---|
| Total change in seasonality level | -2.457 (100%) | -0.606 (100%) |
| Intra-provincial effect (how change in each province's seasonality contributed to total effect) | -2.516 (102%) | -0.532 (88%) |
| Inter-provincial effect (how the distribution of employment across provinces changed) | -0.142 (6%) | -0.046 (8%) |
| Interaction effect (how provincial seasonality changes are simultaneously accompanied by distributional changes) | 0.200 (-8%) | -0.029 (5%) |

### 2.4.1 Seasonality of employment by industry and province from 1976 to 1997

Seasonality is generally thought of as a phenomenon associated with particular industries. This section now examine how employment seasonality is reflected in the broad industrial groups in Canada and in the provinces.[11] The most consistently seasonal Canadian industries are fishing and trapping, logging and forestry, agriculture and construction. Indeed, these industries are traditionally associated with the phenomenon of seasonal work (Tables 2.6a and 2.6b). Yet there is a certain degree of seasonality in other industries as well, albeit to a lesser extent. Generally speaking, the seasonal peaks and troughs for the various industries happen approximately at the same time within a year, despite certain differences, implying an average correlation of 0.76 across all industries.[12] Seasonal swings in the primary and construction industries are no more highly correlated among themselves than they are with seasonal movements in other industries. However, retail trade has a different seasonal profile over the course of the year, since its annual peak occurs in December.

In the provinces taken individually, industries that are traditionally considered as seasonal generally turn out to be among the most highly seasonal. Yet other industries also show seasonal behaviour, at least in some provinces. For example, in Newfoundland, Prince Edward Island, Nova Scotia and New Brunswick, the most highly seasonal provinces in terms of total employment, the manufacturing industry has a fairly high level of seasonality.[13] This is not the case to the same extent for Canada as a whole, or for the Prairies and British Columbia. This can be explained, in part, by the fact that in the Atlantic provinces, manufacturing is based on inputs that are more seasonal than elsewhere in the country [HRDC (1995)].

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[11] Note that Statistics Canada produces seasonally adjusted employment data by industry only for Canada as a whole. In the case of the provinces, it adjusts total employment data, but does not do so for each industry. For purposes of this analysis, we have used the seasonally adjusted series of Statistics Canada wherever possible. For industries within each province, we adjusted the series ourselves, using the X-11-ARIMA additive method. Since the seasonally adjusted totals for each province are those of Statistics Canada, while the series by industry in each province were adjusted independently, the sum of the series for seasonally adjusted employment in each industry will not be exactly equal to the seasonally adjusted totals from Statistics Canada, to which we refer in this portion of the paper.

[12] This is based on the unweighted average of bivariate correlations for all major industrial groups.

[13] This province's small size prevents us from according much importance to the qualitative analysis of results for it.

Mining, quarrying and oil wells has a level of seasonality that exceeds the average of all industries everywhere except in Newfoundland. Yet the weight of this industry in total employment is low or very low in Canada and in all provinces, except for Alberta, Saskatchewan and Newfoundland. The utilities sector is fairly seasonal across Canada. This could be due, for example, to the fact that the demand for electricity and other forms of energy is greater in winter, when heating needs rise.

While there are seasonal patterns in the retail trade sector such as the increase in employment in the Christmas season, overall this sector exhibits relatively low seasonality. Nationally, on average, between 1976 and 1997, average seasonal amplitude and mean seasonal variation in this sector were lower than the all–industry figure. The only exception to this rule in Manitoba, where the seasonal amplitude of employment in retail trade is slightly higher than the provincial all–industry figure. In the wholesale trade sector, seasonality is greater than that observed in the retail sector in all provinces. In fact, wholesale trade can be regarded as a seasonal industry, at least in Nova Scotia, in the Prairies and in British Columbia.

Public administration shows a higher level of seasonality than the all–industry average, regardless of the measure used. The seasonal amplitude of employment was 12.5 per cent for public administration, compared to 7.6 per cent for all industries. The mean seasonal variation was 3.8 per cent, compared to 2.2 per cent for all industries. Throughout this period, the public administration sector ranked 6 out of 13 in terms of seasonality for Canada as a whole, using the two measures of seasonality. The explanation for this performance relates, among other things, to the seasonal nature of certain government activities, such as the spring timing of the taxation season. Public administration also includes education and health care, where activity varies depending on the season. The discrepancy between seasonality in public administration employment and the all–industry figure is more pronounced in the western half of the country than in the eastern part. In fact it disappears almost completely east of Quebec. In the Prairie Provinces and British Columbia, public administration seasonality is more than double the all-industry average.

Table 2.6A

**Seasonal amplitude of employment as a proportion of total employment by industry, Canada and provinces, average, 1976-1997**

Percentages

| | *Can.* | *Nfld.* | *PEI* | *NS* | *NB* | *Que.* | *Ont.* | *Man.* | *Sask.* | *Alta.* | *BC* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| All industries | 7.56 | 23.34 | 23.01 | 11.80 | 16.36 | 8.94 | 6.21 | 6.16 | 8.66 | 5.75 | 6.70 |
| Agriculture | 24.79 | 94.33 | 34.42 | 53.47 | 45.33 | 31.82 | 29.88 | 18.32 | 21.37 | 17.78 | 42.81 |
| Fishing and trapping | 40.48 | 69.60 | 100.64 | 63.16 | 119.08 | 215.45 | 137.93 | 204.75 | 109.14 | 9.45 | 71.52 |
| Forestry | 34.61 | 143.10 | 159.14 | 50.01 | 95.97 | 79.36 | 52.57 | 60.39 | 222.86 | 63.69 | 24.99 |
| Mining, quarrying, oil and gas | 16.76 | 17.13 | 31.17 | 21.48 | 27.43 | 24.31 | 14.22 | 20.29 | 13.61 | 9.38 | 14.23 |
| Utilities | 8.45 | 21.82 | 62.60 | 15.32 | 22.64 | 11.83 | 11.27 | 13.45 | 13.86 | 15.82 | 21.66 |
| Manufacturing | 8.34 | 68.24 | 56.43 | 17.57 | 27.77 | 9.13 | 6.18 | 7.77 | 11.51 | 7.12 | 10.10 |
| Construction | 30.30 | 65.29 | 63.36 | 46.03 | 58.61 | 39.40 | 30.29 | 37.20 | 37.49 | 26.13 | 20.55 |
| Transportation, warehousing and communications | 6.68 | 15.59 | 32.92 | 12.43 | 14.76 | 9.32 | 7.00 | 10.90 | 10.37 | 6.58 | 8.66 |
| Wholesale trade | 7.28 | 19.78 | 18.98 | 18.30 | 13.03 | 9.66 | 7.14 | 11.42 | 11.72 | 6.92 | 11.48 |
| Retail trade | 4.42 | 13.95 | 14.94 | 9.44 | 8.25 | 6.28 | 5.38 | 6.70 | 7.73 | 5.26 | 5.15 |
| Finance, insurance and real estate (F.I.R.E.) | 3.77 | 12.31 | 18.51 | 11.70 | 12.24 | 8.47 | 4.70 | 7.18 | 10.13 | 7.84 | 6.08 |
| Community, business and personal services | 3.65 | 7.63 | 18.06 | 4.71 | 7.29 | 4.78 | 4.09 | 3.19 | 4.79 | 3.10 | 3.53 |
| Public administration | 12.48 | 25.59 | 24.25 | 16.60 | 23.12 | 13.73 | 10.85 | 15.25 | 20.40 | 15.99 | 14.41 |

Note: In tables 2.6a and 2.6b the weighted average of results for each province, for a given industry, may differ from the result for the same industry in Canada as a whole. For example in Table 2.6a the measured seasonal amplitude is based on the months of peak and trough. Since these may differ from one province to another, and therefore be different from the Canada-wide figures, the sum of these measures for Canada does not constitute a weighted average of provincial measures for a given industry. A further reason for this lies in the fact that seasonally adjusted data by province for each industry are produced independently from those for Canada, except in the case of all-industry series. The effect of independent seasonal adjustment is therefore apparent in all the lines of tables 2.6a and 2.6b, except for the first line.

Table 2.6B

**Mean seasonal variation of employment as a proportion of total employment by industry, Canada and provinces, average, 1976-1997**

Percentage

| | *Can.* | *Nfld.* | *PEI* | *NS* | *NB* | *Que.* | *Ont.* | *Man.* | *Sask.* | *Alta.* | *BC* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| All industries | 2.20 | 6.68 | 7.84 | 3.50 | 5.46 | 2.52 | 1.69 | 1.91 | 2.88 | 1.63 | 1.89 |
| Agriculture | 7.77 | 23.95 | 7.89 | 14.01 | 13.82 | 9.34 | 8.14 | 6.13 | 7.36 | 5.66 | 10.90 |
| Fishing and trapping | 13.14 | 22.43 | 28.57 | 16.34 | 31.98 | 60.52 | 57.87 | 71.90 | 80.21 | 98.91 | 15.95 |
| Forestry | 9.84 | 42.01 | 55.62 | 13.49 | 29.10 | 23.79 | 13.49 | 15.68 | 41.73 | 16.71 | 6.15 |
| Mining, quarrying, oil and gas | 4.93 | 4.64 | 93.21 | 5.73 | 7.99 | 6.80 | 3.60 | 4.71 | 3.22 | 2.22 | 3.51 |
| Utilities | 2.31 | 5.81 | 14.36 | 3.34 | 5.89 | 3.12 | 2.80 | 3.36 | 3.64 | 3.62 | 5.49 |
| Manufacturing | 2.29 | 19.68 | 16.95 | 5.40 | 9.56 | 2.81 | 1.58 | 1.84 | 2.84 | 1.87 | 2.63 |
| Construction | 10.17 | 21.74 | 20.32 | 15.16 | 19.49 | 13.78 | 9.52 | 11.55 | 11.89 | 7.94 | 5.62 |
| Transportation, warehousing and communications | 1.90 | 3.72 | 9.61 | 2.94 | 3.89 | 2.48 | 1.80 | 3.11 | 2.48 | 1.52 | 2.34 |
| Wholesale trade | 2.08 | 5.16 | 4.81 | 5.20 | 3.46 | 2.46 | 2.07 | 2.91 | 3.31 | 2.00 | 3.39 |
| Retail trade | 1.17 | 3.79 | 4.14 | 2.37 | 2.12 | 1.62 | 1.14 | 1.41 | 2.13 | 1.04 | 1.45 |
| Finance, insurance and real estate (F.I.R.E.) | 1.05 | 3.12 | 4.61 | 2.90 | 2.91 | 2.11 | 1.20 | 1.76 | 2.59 | 1.99 | 1.33 |
| Community, business and personal services | 0.88 | 1.83 | 5.14 | 1.18 | 1.75 | 1.13 | 1.10 | 0.76 | 1.14 | 0.76 | 0.88 |
| Public administration | 3.83 | 6.19 | 6.51 | 4.33 | 6.04 | 3.73 | 3.18 | 4.01 | 6.22 | 4.58 | 3.92 |

Generally speaking, across Canada, employment is the most seasonal in the primary and construction industries. Apart from public administration, where employment is quite seasonal, tertiary industries, and in particular community, business and personal services, finance, insurance and real estate, and retail trade, are the least seasonal. Nonetheless, the fact that employment seasonality is widespread is important. Primary sector industries and construction account for 38.8 per cent of total amplitude seasonality and 42.9 per cent of total MSV.[14] The majority of employment seasonality (61.2 per cent of total amplitude seasonality and 57.1 per cent of total MSV) is accounted for by other industries.

### 2.4.2 Employment seasonality by industry and province according to two components: intra and the inter-industry effects

Does the higher seasonality of employment in certain provinces have more to do with the seasonal nature of their industries or with the weight of more seasonal industries in their total employment? The results are represented in figures 2.14A and 2.14B. For each year from 1976 to 1997, an estimate is made of the seasonality that each province would show if its industries had the same level of seasonality as their Canadian equivalent. In other words, the seasonalities of Canadian industries are applied to the weighting of each industry in the total average annual employment of each province. Differences across provinces in this measure provide an estimate of the inter-industry effect on the effect of difference in broad industry structures on seasonality. The intra-industry effects are simply the difference between actual the levels of seasonality, whether measured by seasonal amplitude or the mean seasonal variation, and the estimated inter-industry effects. Note that the results presented are averages for the entire period 1976-1997. In comparison with intra-industry effects, inter-industry effects do not vary much from province to province. In concrete terms, this means that if a province is more seasonal than Canada as a whole, this will have more to do with the behaviour of its seasonal industries than with the weighting of those industries in total provincial employment.

[14] These are industry shares of total amplitude seasonality or MSV calculated as the weighted sums of industry seasonality. This sum differs from the seasonal amplitude and MSV of total employment, where the seasonal fluctuations of different industries are netted out.

Figure 2.14A
**Seasonal amplitude of employment: intra- and inter-industry effects**
Canada and provinces, average, 1976-1997

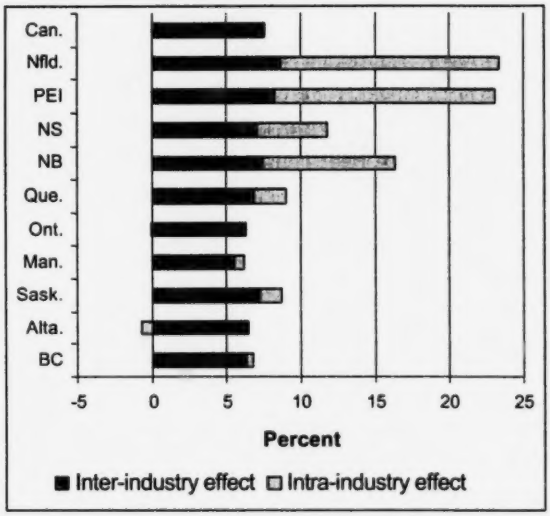
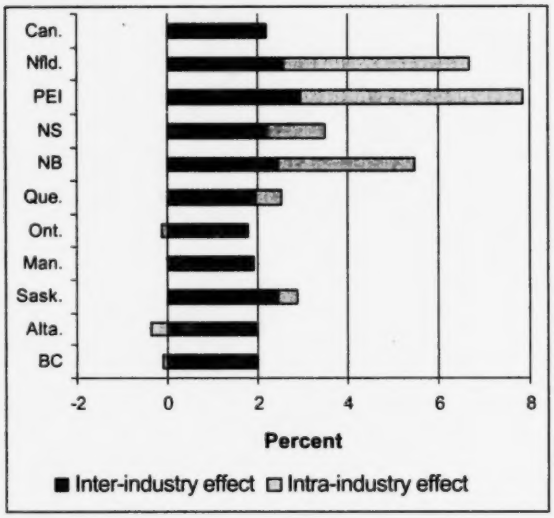



Figure 2.14B
**Mean seasonal variation of employment: intra- and inter-industry effects**
Canada and provinces, average, 1976-1997




### 2.4.3 Changes in employment seasonality by industry and province between 1976 and 1997

All Canadian provinces recorded a decline in employment seasonality over the last two decades. Can these declines in Canada and in the provinces be attributed to diminishing employment seasonality within industries (intra-industry effect)? Or is it due rather to changes in the total employment distribution among industries (inter-industry effect or composition effect)? In other words, does the decline in employment seasonality reflect the fact that the proportion of jobs in the most seasonal industries is now lower, or is it because these industries have become less seasonal over time?

The answer is that both factors have played a role (Tables 2.7a and 2.7b). For Canada as a whole, the decline in seasonality owes more to the inter-industry effect than to the intra-industry effect of the decline in the seasonal amplitude of employment, 1.3 percentage points derives from the inter-industry effect and one percentage point from the intra-industry effect. For the decline in the mean seasonal variation, the values are 0.4 and 0.3 percentage points respectively. Note that large interaction effects (based on the definition of shift-share analysis) mean that the swings in question

are relatively large with respect to the initial levels. In other words, the larger the changes in the variable, the greater the interaction effects will be.

From 1976 to 1997, the provinces generally saw their most seasonal industries lose a portion of their seasonal character. Moreover, the declining overall weight of these industries in total employment has also helped to reduce employment seasonality in all provinces, and therefore in Canada. The intra-industry effect would seem to be more important than the inter-industry effect for at least four of the five most westerly provinces, while the reverse is true to the east. Once again, the exception to this rule is Prince Edward Island, where the inter-industry effect has helped significantly in counteracting the negative impact of the intra-industry effect on the province's seasonality. This province would therefore seem to be in a class of its own in this regard. In fact, PEI is the only province where the inter-industry effect (composition effect) has a positive sign, whether changes in the seasonal amplitude of employment or changes in its mean seasonal variation are considered.

Whatever the seasonality measure used in this shift-share analysis, the seasonality of the most seasonal industries seems to have risen from 1976 to 1997 in New Brunswick. This occurred despite the fact that the seasonality of total employment in this province declined during this period. The same is true for Nova Scotia, if the shift-share analysis is based solely on the seasonal amplitude of employment and not on mean seasonal variation. In fact, using MSV, the intra-industry effect is moderately negative in Nova Scotia. This means, generally speaking, that the size of seasonal swings in the most seasonal industries rose in Nova Scotia from 1976 to 1997, although the average intensity of seasonal movements declined during the same period. Throughout the rest of Canada, the intra-industry effect has a negative sign, regardless of the seasonality measure used.

Table 2.7A

## Changes in seasonal amplitude of employment: intra- and inter-industry effects, Canada and provinces, 1976-1997

Percentage points, percentage in brackets

| | **Total change** | **Intra-industry effect** | **Inter-industry effect** (composition effect) | **Interaction effect, cancellation effect and residual** |
|---|---|---|---|---|
| Can. | -2.457 | -1.030 | -1.317 | -0.110 |
| | (100) | (42) | (54) | (4) |
| Nfld. | -4.568 | -1.355 | -2.811 | -0.402 |
| PEI | -0.310 | -4.501 | 6.169 | -1.977 |
| NS | -2.323 | 1.086 | -1.727 | -1.682 |
| NB | -2.554 | 0.994 | -1.506 | -2.042 |
| Que. | -2.448 | -0.211 | -1.005 | -1.232 |
| Ont. | -2.130 | -2.478 | -1.017 | 1.366 |
| Man. | -3.023 | -1.775 | -0.543 | -0.705 |
| Sask. | -5.132 | -4.656 | -2.143 | 1.667 |
| Alta. | -2.556 | -2.041 | -2.081 | 1.567 |
| BC | -2.676 | -3.106 | -0.994 | 1.424 |

Table 2.7B

## Changes in mean seasonal variation of employment: intra- and inter-industry effects, Canada and provinces, 1976-1997

Percentage points, percentage in brackets

| | **Total change** | **Intra-industry effect** | **Inter-industry effect** (composition effect) | **Interaction effect and residual** |
|---|---|---|---|---|
| Can. | -0.606 | -0.344 | -0.413 | 0.151 |
| | (100) | (57) | (68) | (-25) |
| Nfld. | -1.636 | -0.318 | -0.758 | -0.559 |
| PEI | -0.023 | -1.649 | 1.475 | 0.151 |
| NS | -0.620 | -0.128 | -0.525 | 0.033 |
| NB | -0.506 | 0.154 | -0.558 | -0.102 |
| Que. | -0.336 | -0.057 | -0.360 | 0.081 |
| Ont. | -0.505 | -0.757 | -0.288 | 0.540 |
| Man. | -0.879 | -0.362 | -0.118 | -0.400 |
| Sask. | -1.296 | -1.170 | -0.688 | 0.562 |
| Alta. | -0.589 | -0.782 | -0.631 | 0.824 |
| BC | -0.470 | -0.678 | -0.331 | 0.540 |

During the period 1976-1997, seasonality showed a downward trend in most industries. The decline was particularly noticeable in the late 1970s in the fishing and trapping sector in Newfoundland and Prince Edward Island, where it never again returned to the levels of the mid-1970s. Likewise, employment in this industry in these two provinces grew spectacularly in the late 1970s, and never returned to the levels of the mid-1970s. In 1977, Canada imposed a 200-mile limit around its coastline, within which foreigners were no longer allowed to finish. This left much more room for Canadians to fish, and for this reason, the number of people employed in the industry at this time in eastern Canada rose considerably [see Royal Commission on Employment and Unemployment, Newfoundland and Labrador, (1986)]. This growth in the fishing and trapping industry in Newfoundland and Prince Edward Island was also accompanied by a wave of investment that probably contributed to reducing its seasonality.

# 3. Labour force seasonality and comparison with employment seasonality

## 3.1 Overview of labour force seasonality for Canada

The labour force is also affected by seasonal patterns. While the labour force adjusts at least to some extent to seasonal fluctuations in employment, seasonality of the labour force is also affected by other factors. Seasonality in the labour force depends on: 1) seasonality in employment; 2) the preferences of individuals for seasonal versus year-round employment; 3) the response of the labour force to lack of employment opportunities in the off season; and 4) the impact of EI that reduces the financial need to find employment in the off-season but also imposes job search requirements as a condition of benefit receipt. For example, a strong desire for year round employment in a region with highly seasonal employment may lead to a relatively stable labour force. Conversely, if workers have a preference for seasonal employment, then the labour force will follow employment relatively closely. In spite of a desire for off-season employment, individuals may withdraw in the off-season because of a lack of employment opportunities. However, even in the extreme case where there is a perfect match between seasonal jobs and individuals who only wanted seasonal employment, the economic cost of misallocated resources because of seasonal instability in production would remain.

In Canada, seasonal amplitude of the labour force dropped quite steadily from 7.4 per cent in 1976 to 5.4 per cent in 1992, and has since hovered around that point (Figure 3.1). Mean seasonal variation declined from 2.1 per cent in 1976 to 1.5 per cent from 1991 onward. Both the seasonal amplitude and the mean seasonal variation show a strong decline during the early years, with perhaps some cyclical effects, followed by a more gradual decline and some levelling out in the final years.

Seasonality of the labour force is lower than that of employment. Over time, mean seasonal variation in the labour force has declined at about the same rate as mean seasonal variation in employment. However, amplitude seasonality in the labour force has declined less than for employment. Moreover, there is an impression of labour force seasonality bottoming out in recent years whereas this was not apparent for employment seasonality. All of this evidence reflects the

obvious fact that employment ups and downs are more volatile than labour force fluctuations; i.e., a person's job is more likely to end or start suddenly than their availability for work.

## 3.2 Labour force seasonality by sex

As in the case of employment, the labour force shows a higher degree of seasonality for men than for women, according to both seasonal amplitude and mean seasonal valuation. Moreover, the degree of seasonality has tended to decline both for men and for women. Yet the gap in seasonality between the two sexes is weaker for the labour force than for employment. For the seasonal amplitude of the labour force, it was 1.5 percentage points in 1976 (8.0 vs. 6.4) and 2.1 percentage points in 1997 (6.3 vs. 4.2)(Figure 3.1). Using the mean seasonal variation, the gap was 0.6 percentage points in 1976 (2.3 vs. 1.7) and 0.5 in 1997 (1.8 vs. 1.3)(Figure 3.2).

As with employment, these two measures of seasonality show that the gap between men and women was higher from 1980 to 1990 than for the rest of the period covered. The gap was widest in 1981, under both measures: 2.9 percentage points for the amplitude measure and 0.9 for the MSV. The gap between men and women, moreover, appears to have a cyclical component.

Figure 3.1
**Seasonal Amplitude of the labour force**
By sex, Canada, 1976-1997

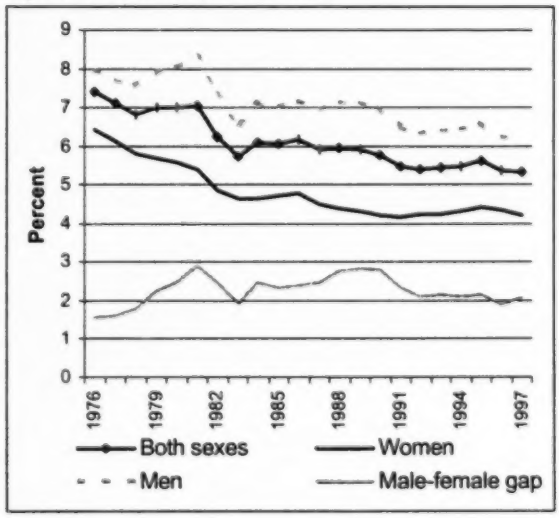
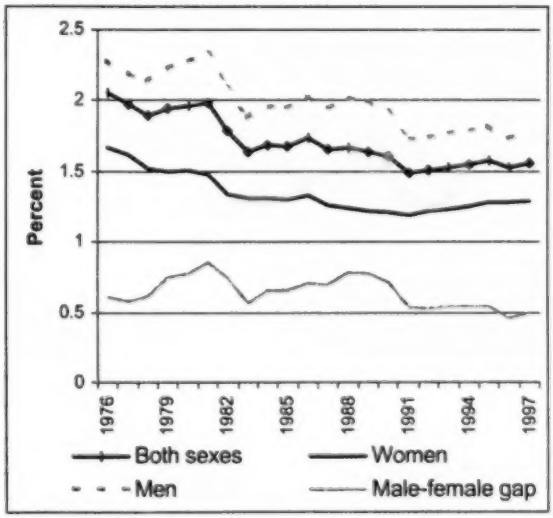


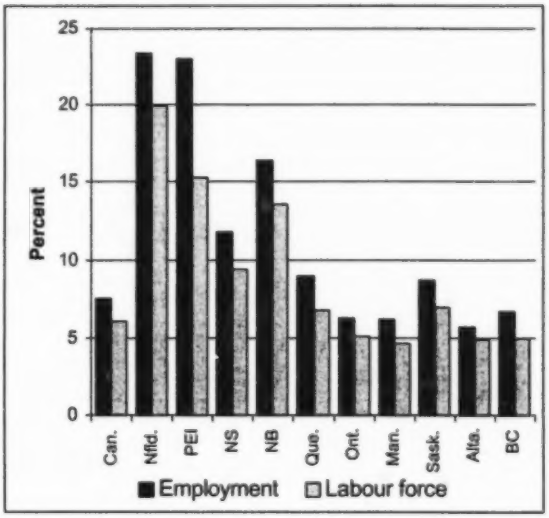

Figure 3.2
**Mean seasonal variation of the labour force**
By sex, Canada



## 3.3 Labour force seasonality by province

In terms of the magnitude of seasonal movements, labour force and employment exhibit similar patterns across provinces over the period 1976-1997. Seasonality of both the labour force and employment is highest in the Atlantic provinces and declines from east to west (Figure 3.4, Tables 2.6a and 2.6b, Tables 3.5a and 3.5b) The principal difference between the two is that the labour force is somewhat less seasonal than employment throughout Canada. This difference is more marked in the Atlantic provinces, particularly Prince Edward Island.

Figure 3.3
**Seasonal amplitude of employment and labour force**
Canada and provinces, average, 1976-1997




As is evident from a general comparison, seasonal patterns in the labour force apparently follow those in employment. Table 3.1 presents correlation coefficients between seasonal fluctuations in the labour force and those in employment, as measured by the seasonal ratio. The correlations are in the range of 0.94-0.98 for Canada and all the provinces. This indicates that the timing of seasonal fluctuations in employment and labour force are very similar in all provinces.

Table 3.1
**Correlations between seasonal ratios of the labour force and employment, 1976-1997**

| *Can.* | *Nfld.* | *PEI* | *NS* | *NB* | *Que.* | *Ont.* | *Man.* | *Sask.* | *Alta.* | *BC* |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.97 | 0.97 | 0.97 | 0.97 | 0.98 | 0.97 | 0.95 | 0.95 | 0.97 | 0.94 | 0.95 |

In general, the two measures of seasonality provide more consistent results for the labour force than for employment. Provinces that have high seasonal amplitude of their labour force also have a high MSV. (See Table 3.2). The ranking of employment seasonality by these two measures is not nearly as consistent. This may reflect the lower volatility of seasonal fluctuations in the labour force compared to employment. A large seasonal amplitude will lead to greater persistence in

elevated seasonal levels of the labour force than employment, which increases the MSV of the labour force relatively more than that of employment.

Figure 3.4
**Measure of labour force seasonality**
Canada and provinces,average, 1976-1997

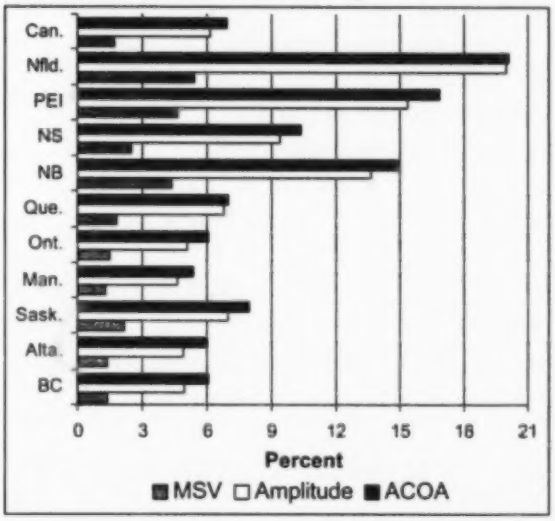



Table 3.2
**Ranking of labour force seasonality by province, average, 1976-1997**

| | *Peak-trough* | *Amplitude* | *MSV* |
|---|---|---|---|
| Nfld. | 1 | 1 | 1 |
| PEI | 2 | 2 | 2 |
| NS | 4 | 4 | 4 |
| NB | 3 | 3 | 3 |
| Que. | 6 | 6 | 6 |
| Ont. | 7 | 7 | 7 |
| Man. | 10 | 10 | 10 |
| Sask. | 5 | 5 | 5 |
| Alta. | 9 | 9 | 8 |
| BC | 8 | 8 | 9 |

The provinces tend to fall into the same four seasonality categories that were used to rank employment seasonality: ranging from very high seasonality for Newfoundland and Prince Edward Island to low seasonality for the provinces of Ontario, Manitoba, Alberta and British Columbia.

The declines in labour force seasonality over time have been similar to those in employment seasonality (Figures 3.6, 3.7, 2.12 and 2.13). However, two aspects of this change are worth noting. First, the provinces with the lowest labour force seasonality (Ontario, Manitoba, Alberta and British Columbia) have consistently remained in this group over the entire 1976-1997 period. Then in 1985, Manitoba's labour force seasonality fell below that of all other provinces and has remained so continuously through to 1997.

Second, the trend in labour force seasonality in Prince Edward Island differs from the pattern for employment seasonality. PEI had the highest decline in labour force seasonality of all ten provinces over the 21-year period, while employment seasonality remained at a standstill. This result signifies that workers are increasingly remaining in the labour force throughout the year

despite the fact that Prince Edward Island's job market has continued to be among the two most seasonal in Canada.

Figure 3.5
**Seasonal amplitude of the labour force**
Canada and provinces, 1976 and 1997

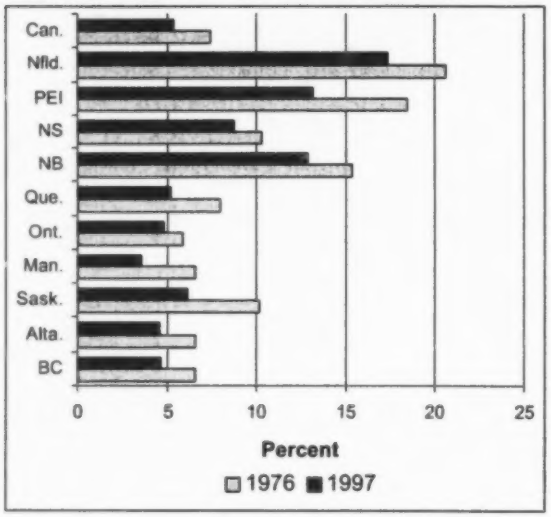
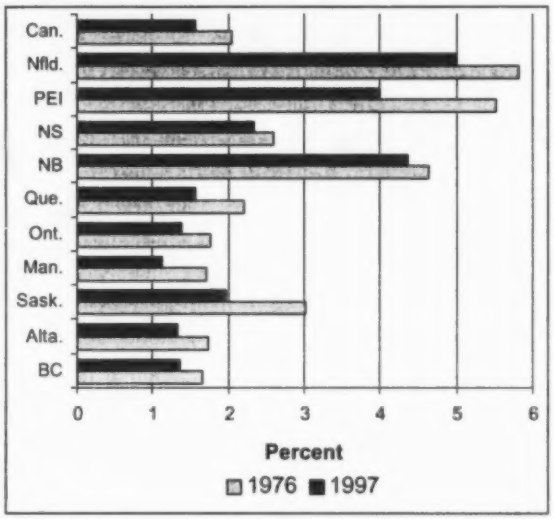



Figure 3.6
**Mean seasonal variation of the labour force**
Canada and provinces, 1976 and 1997




Labour force seasonality, as measured by its correlation with a time trend, is declining, similar to the decline in employment (see Tables 3.3 and 2.4). Labour force seasonality is declining in all provinces, with the strongest decline, as expected, in Prince Edward Island.

Table 3.3
**Correlation between labour force seasonality levels and time trend, 1976 - 1997**

| | *Amplitude seasonality* | *Mean seasonal variation* |
|---|---|---|
| Can. | -0.921 | -0.906 |
| Nfld. | -0.444 | -0.757 |
| PEI | -0.970 | -0.957 |
| NS | -0.698 | -0.452 |
| NB | -0.874 | -0.407 |
| Que. | -0.916 | -0.873 |
| Ont. | -0.842 | -0.891 |
| Man. | -0.891 | -0.848 |
| Sask. | -0.897 | -0.886 |
| Alta. | -0.658 | -0.459 |
| BC | -0.499 | -0.447 |

The provincial contributions to the overall decline in labour force seasonality for Canada are shown in Table 3.4. It is not surprising to see that the 2.04 percentage point decline in amplitude seasonality was very strongly driven by changes in provincial seasonality (2.01 per cent). The other two effects contributing to the change in amplitude — inter-provincial and interaction effects — nearly cancel out over the 21-year time span. The same is true for mean seasonal variation.

Table 3.4
**Decomposition of decline in labour force seasonality for Canada by provincial seasonality effects, 1976-1997, shift-share analysis**

| | Amplitude seasonality | Mean seasonal variation |
|---|---|---|
| Total change in seasonality level | -2.044 (100%) | -0.492 (100%) |
| Intra-provincial effect (how change in each province's seasonality contributed to total effect) | -2.013 (98%) | -0.485 (99%) |
| Inter-provincial effect (how the distribution of labour force across provinces changed) | -0.106 (5%) | -0.034 (7%) |
| Interaction effect (how provincial seasonality changes are simultaneously accompanied by distributional changes) | 0.074 (-4%) | 0.027 (-5%) |

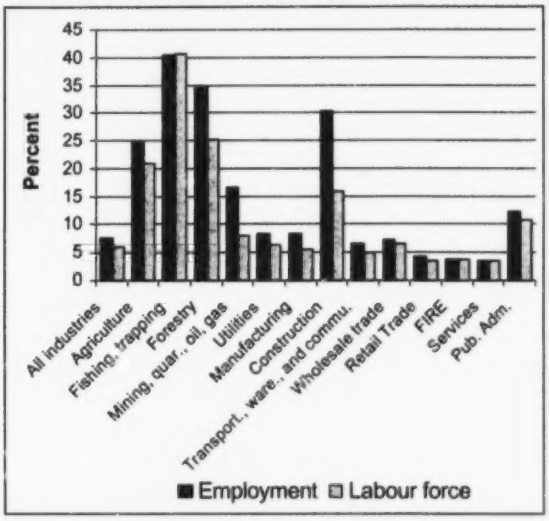
### 3.3.1 Labour force seasonality by industry and province, 1976 to 1997

In Canada, the pattern of seasonal fluctuations of the labour force by industry is quite similar to that of employment by industry, in several respects.[15, 16] For example, the most highly seasonal industries in terms of both employment and labour force are largely the same (Figure 3.8, Tables 2.6a and 2.6b., Tables 3.5a and 3.5b). Thus, the fishing and trapping, logging and forestry, agriculture and construction industries have the greatest seasonal variations, whether we are speaking of the employment or the labour force.

[15] Note that Statistics Canada does not provide seasonally adjusted series of the labour force by industry for Canada and the provinces, but only for the total labour force series. For purposes of this analysis, we have performed our own seasonal adjustment of the series by industry, using the X-11-ARIMA additive method. Since the seasonally adjusted totals are those of Statistics Canada, while the series by industry were adjusted independently, the sum of the seasonally adjusted labour force series for each industry will not be exactly equal to the seasonally adjusted totals from Statistics Canada, to which we refer in this portion of the paper.

[16] In the case of the labour force, the industry is defined in terms of the principal previous occupation, if the respondent is unemployed, and in terms of the principal current occupation, if the respondent is employed using the definitions of unemployed and employed in the Labour Force Survey.

Figure 3.7
**Seasonal amplitude of employment and the labour force**
Canadian industries, average, 1976-1997




In general, labour force seasonality in the broad industrial groups is again slightly weaker than that of employment. In the primary industries, the labour force is on the whole significantly less seasonal than employment. In the mining, quarrying and oil wells and in construction, the labour force shows only about half as much seasonal fluctuation as is the case for employment. An exception is the fishing and trapping industry, where the seasonality of employment is even slightly lower than that of the labour force. The tertiary industries generally tend to have a labour force with a degree of seasonality close to that of employment, unlike the primary and secondary industries.

At the provincial level, the industries with the greatest seasonal labour force fluctuations are the same as for Canada as a whole, i.e. fishing and trapping, logging and forestry, agriculture and construction (Table 3.5a and 3.5b). The utilities sector, as well as mining, quarrying and oil wells, appear to have a certain level of seasonality everywhere in Canada. Manufacturing industries appear to be fairly seasonal in the Atlantic Provinces, while they are distinctly less so in the other provinces, particularly in Ontario and Quebec.

Public administration shows seasonal fluctuations throughout the country; relative to the all-industry average, it is especially high west of New Brunswick. Nevertheless, other tertiary industries show little or no seasonality. The retail trade sector cannot be considered as seasonal, except in Manitoba. Wholesale trade is slightly more seasonal than retail trade.

Table 3.5A

**Seasonal amplitude of the labour force as a proportion of the total labour force by industry, Canada and provinces, average, 1976-1997**

Percentages

| | *Can.* | *Nfld.* | *PEI* | *NS* | *NB* | *Que.* | *Ont.* | *Man.* | *Sask.* | *Alta.* | *BC* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| All industries | 6.11 | 19.97 | 15.29 | 9.39 | 13.63 | 6.76 | 5.08 | 4.63 | 7.00 | 4.86 | 4.94 |
| Agriculture | 20.93 | 58.13 | 21.53 | 39.53 | 36.65 | 26.15 | 24.77 | 15.43 | 19.70 | 16.85 | 31.34 |
| Fishing and trapping | 40.60 | 59.58 | 61.20 | 44.67 | 84.94 | 147.30 | 118.02 | 168.56 | 103.61 | 14.30 | 47.31 |
| Forestry | 25.40 | 59.05 | 69.33 | 29.53 | 53.95 | 37.13 | 35.55 | 50.30 | 103.17 | 51.87 | 13.40 |
| Mining, quarrying, oil and gas | 8.00 | 14.17 | 95.04 | 16.27 | 22.47 | 18.15 | 10.64 | 15.55 | 10.63 | 6.93 | 12.41 |
| Utilities | 6.40 | 19.04 | 57.32 | 14.66 | 22.48 | 9.63 | 9.95 | 12.65 | 15.04 | 11.85 | 19.84 |
| Manufacturing | 5.56 | 51.74 | 30.75 | 12.74 | 20.35 | 5.91 | 4.56 | 6.46 | 9.63 | 6.36 | 7.54 |
| Construction | 15.97 | 30.12 | 31.93 | 23.50 | 34.55 | 20.37 | 16.73 | 15.95 | 19.69 | 15.23 | 11.32 |
| Transportation, warehousing and communications | 5.03 | 11.61 | 18.63 | 8.70 | 11.19 | 7.55 | 6.08 | 8.95 | 7.95 | 4.93 | 7.47 |
| Wholesale trade | 6.54 | 15.24 | 16.65 | 15.46 | 10.51 | 8.18 | 7.61 | 10.05 | 10.81 | 6.46 | 11.36 |
| Retail trade | 3.52 | 11.44 | 11.39 | 7.76 | 6.39 | 5.20 | 4.32 | 6.46 | 6.52 | 4.91 | 3.63 |
| Finance, insurance and real estate (F.I.R.E.) | 3.71 | 12.84 | 18.72 | 10.27 | 11.71 | 8.69 | 4.63 | 6.84 | 8.89 | 7.23 | 5.61 |
| Community, business and personal services | 3.51 | 7.72 | 14.91 | 4.93 | 7.69 | 4.21 | 4.75 | 3.01 | 4.87 | 2.93 | 3.19 |
| Public administration | 10.96 | 22.75 | 17.10 | 14.18 | 19.29 | 12.89 | 10.33 | 12.89 | 16.21 | 13.62 | 12.68 |

Note: In Tables 3.5a and 3.5b the weighted average of results from all the provinces, for a given industry, may differ from the result for the same industry in Canada as a whole. For example, in Table 3.5a the measured seasonal amplitude is based on the month's seasonal of peak and trough. Since these may differ from one province to another, and therefore be different from the Canada-wide figures, the sum of these measures for Canada does not constitute a weighted average of provincial figures for a given industry. A further reason for this lies in the fact that seasonally adjusted data by province for each industry are produced independently from those for Canada, except in the case of all-industry series. The effect of independent seasonal adjustment is therefore apparent in all the lines of tables 3.5a and 3.5b, except for the first one.

Table 3.5B

**Mean seasonal variation of the labour force as a proportion of the total labour force by industry, Canada and provinces, average, 1976-1997**

Percentages

| | *Can.* | *Nfld.* | *PEI* | *NS* | *NB* | *Que.* | *Ont.* | *Man.* | *Sask.* | *Alta.* | *BC* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| All industries | 1.71 | 5.39 | 4.66 | 2.51 | 4.35 | 1.82 | 1.51 | 1.30 | 2.16 | 1.37 | 1.37 |
| Agriculture | 6.39 | 15.65 | 4.59 | 10.01 | 9.96 | 7.23 | 6.84 | 5.13 | 6.64 | 5.36 | 7.43 |
| Fishing and trapping | 13.36 | 19.43 | 19.23 | 12.16 | 23.51 | 38.38 | 38.63 | 59.26 | 77.77 | 98.56 | 10.97 |
| Forestry | 6.50 | 18.02 | 19.55 | 7.56 | 16.53 | 11.66 | 9.94 | 12.67 | 22.84 | 11.75 | 2.96 |
| Mining, quarrying, oil and gas | 2.18 | 3.43 | 83.79 | 4.15 | 6.43 | 4.59 | 2.64 | 3.36 | 2.78 | 1.89 | 2.99 |
| Utilities | 1.63 | 5.02 | 12.52 | 3.48 | 5.89 | 2.32 | 2.57 | 3.01 | 3.72 | 2.87 | 5.39 |
| Manufacturing | 1.46 | 14.98 | 9.49 | 3.63 | 6.75 | 1.63 | 1.01 | 1.69 | 2.07 | 1.50 | 1.97 |
| Construction | 4.97 | 8.42 | 9.41 | 7.21 | 10.37 | 7.06 | 4.68 | 4.52 | 5.77 | 4.14 | 2.70 |
| Transportation, warehousing and communications | 1.47 | 2.80 | 5.05 | 2.25 | 2.91 | 1.92 | 1.78 | 2.42 | 1.73 | 1.07 | 1.77 |
| Wholesale trade | 1.90 | 3.73 | 3.99 | 4.36 | 2.93 | 1.99 | 2.09 | 2.50 | 2.83 | 1.92 | 3.19 |
| Retail Trade | 0.80 | 2.92 | 2.93 | 1.85 | 1.86 | 1.37 | 0.94 | 1.41 | 1.57 | 1.07 | 0.92 |
| Finance, insurance and real estate (F.I.R.E.) | 1.04 | 3.00 | 4.61 | 2.69 | 2.88 | 2.14 | 1.18 | 1.61 | 2.31 | 1.93 | 1.33 |
| Community, business and personal services | 1.11 | 2.02 | 3.96 | 1.22 | 2.07 | 1.09 | 1.40 | 0.68 | 1.05 | 0.85 | 0.80 |
| Public administration | 3.42 | 5.44 | 4.36 | 3.74 | 4.96 | 3.43 | 3.06 | 3.20 | 4.87 | 3.89 | 3.45 |

### 3.3.2 Labour force seasonality by industry and province according to two components: intra and the inter-industry effects

As with our analysis of employment seasonality by industry, we have broken down the two main seasonality indices for the labour force into inter- and intra-industry affects (see Figure 3.8a and 3.8b). Thus, if one province has a more highly seasonal labour force than that of Canada as a whole, this will have more to do with the fact that its seasonal industries have sharper seasonal fluctuations than with a higher share of the province's total labour force being engaged in these industries.

Figure 3.8A
**Seasonal amplitude of the labour force: intra- and inter-industry effects**
Canada and provinces, average, 1976-1997

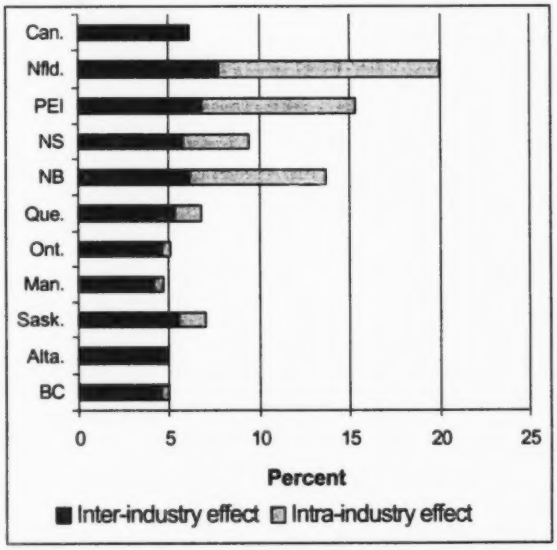
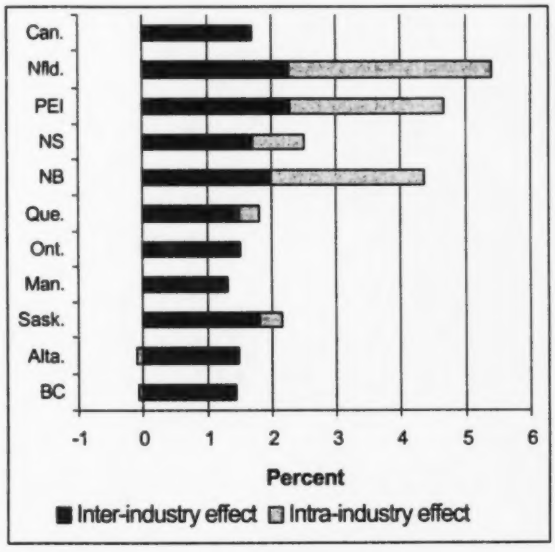



Figure 3.8B
**Mean seasonal variation of the labour force: intra- and inter-industry effects**
Canada and provinces, average, 1976-1997




### 3.3.3 Changes in labour force seasonality by industry and province between 1976 and 1997

Seasonal fluctuation in the labour force declined in Canada and in the provinces between 1976 and 1997. Tables 3.6A and 3.6Bbreak this down into an intra-industry effect and an inter-industry or compositional effect. For Canada as a whole, the intra-industry effect is more important than the inter-industry effect. In the case of employment, it will be recalled that the inter-industry effect

was the more important. Among the provinces, the inter-industry effect is more important in the five easternmost provinces, taken as a whole, while in the remaining provinces the intra-industry effect is dominant. Similar results were obtained for employment.

Table 3.6A

**Changes in seasonal amplitude of the labour force: intra- and inter-industry effects, Canada and provinces, 1976-1997**

Percentage points, percentage in brackets

| | Total change | Intra-industry effect | Inter-industry effect *(composition effect)* | Interaction effect, cancellation effect and residual |
|---|---|---|---|---|
| Can. | -2.044 (100) | -1.392 (68) | -0.928 (45) | 0.276 (-14) |
| Nfld. | -3.245 | -0.358 | -1.352 | -1.536 |
| PEI | -5.302 | -7.078 | 3.900 | -2.125 |
| NS | -1.486 | -0.407 | -1.299 | 0.220 |
| NB | -2.489 | 1.091 | -0.938 | -2.642 |
| Que. | -2.785 | -0.103 | -0.674 | -2.008 |
| Ont. | -1.094 | -2.473 | -0.812 | 2.191 |
| Man. | -3.012 | -1.730 | -0.280 | -1.002 |
| Sask. | -4.071 | -4.231 | -1.286 | 1.447 |
| Alta. | -2.030 | -2.523 | -1.871 | 2.365 |
| BC | -1.914 | -1.500 | -0.872 | 0.458 |

Table 3.6B

**Changes in mean seasonal variation of the labour force: intra- and inter-industry effects, Canada and provinces, 1976-1997**

Percentage points, percentage in brackets

| | Total change | Intra-industry effect | Inter-industry effect (composition effect) | Interaction effect and residual |
|---|---|---|---|---|
| Can. | -0.492 (100) | -0.459 (93) | -0.264 (54) | 0.231 (-47) |
| Nfld. | -0.821 | -0.335 | -0.352 | -0.134 |
| PEI | -1.519 | -2.551 | 1.610 | -0.578 |
| NS | -0.261 | -0.117 | -0.373 | 0.230 |
| NB | -0.284 | 0.352 | -0.318 | -0.317 |
| Que. | -0.635 | -0.084 | -0.184 | -0.368 |
| Ont. | -0.385 | -0.641 | -0.223 | 0.479 |
| Man. | -0.597 | -0.431 | -0.049 | -0.117 |
| Sask. | -1.057 | -1.206 | -0.514 | 0.663 |
| Alta. | -0.413 | -0.883 | -0.610 | 1.080 |
| BC | -0.292 | -0.390 | -0.233 | 0.331 |

As was noted earlier, employment seasonality in most industries showed a downward trend over the period 1976-1997. The same phenomenon is apparent in the labour force. Moreover, as was the case for employment, labour force seasonality in the fishing and trapping industry in Newfoundland and PEI dropped sharply at the end of the 1970s, and this effect seems to have persisted since that time. It is noteworthy that this happened when a significant growth occurred in this industry's labour force in these two provinces.

To conclude this section tracing the seasonal profile of the labour force, it should be noted first that seasonal swings in the labour force track those in employment fairly closely. In fact, the size of seasonal swings in the labour force and the timing of seasonal movements over the year are very similar to those for employment. In other words, individuals who quit or lose their jobs after the seasonal peak will most likely leave the labour force. This phenomenon can be seen not only for Canada as a whole, but also in the provinces and in the broad industry groups, both at the national and provincial level. And this is true despite the fact that the seasonal profile of employment may differ from one industry to another, and from province to province.

# 4. Seasonality of the unemployment rate

This section looks at seasonal fluctuations in the Canadian unemployment rate. It starts with a presentation of the two principal measures of seasonality used in this paper: seasonal amplitude and mean seasonal variation.

## 4.1 Seasonal amplitude and mean seasonal variation of the unemployment rate

The unemployment rate depends on the difference between the labour force and employment. In fact, it is by definition the difference between the labour force and employment divided by the labour force. Consequently, seasonality in the unemployment rate reflects differences in the seasonal profile of employment and the labour force. One of the conclusions of Section 3 was that the labour force follows employment relatively closely over the seasons. This suggests that seasonal fluctuations in the unemployment rate are unlikely to reflect the full extent of seasonal under-utilisation of labour and the problems associated with it.

The unemployment rate is strongly influenced by slight differences in the behaviour of the labour force and the employment. Some factors, relating primarily to the behaviour of individuals, have an impact on labour force seasonality without exerting much influence on that of employment. These behavioural factors that have a impact mainly on labour force seasonality will be amplified in the unemployment rate, because the latter depends on the gap between the labour force and employment. The consequence of this is that measures of seasonal amplitude and mean seasonal variation of the unemployment rate are volatile.

Figure 4.1 shows the seasonal amplitude and MSV for the Canadian unemployment rate in 1997. The two measures are expressed as percentages of the seasonally adjusted unemployment rate, and not as percentage points. This means that the measures used in sections 2 and 3 can be retained without having to be modified. It also allows for a comparison of the relative size of seasonality in the unemployment rate with that of employment and the labour force. The seasonal amplitude of the unemployment rate was 18.6 per cent in 1997 (Figure 4.2), compared to only 6.3 per cent for employment and 5.4 per cent for the labour force.

Figure 4.1
**Seasonal amplitude and mean seasonal variation of the unemployment rate**
Canada, 1976-1997

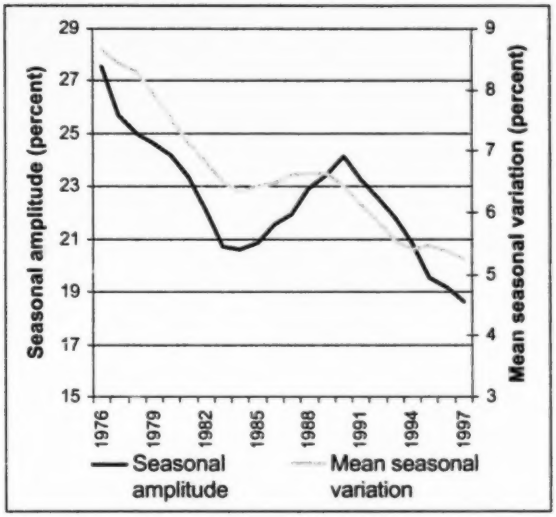
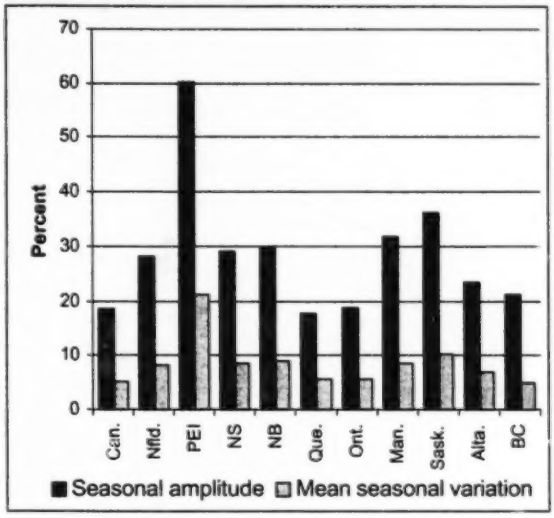



Figure 4.2
**Seasonal amplitude and mean seasonal variation of the unemployment rate**
Canada and provinces, 1997




However, despite their volatility, the seasonal amplitude and the MSV of the unemployment rate are useful concepts. They indicate that the labour force has been tracking seasonal fluctuations in employment more and more closely over time. Unemployment seasonality in Canada declined for the period 1976-1997 as a whole, although there was a slight rise towards the end of the 1980s. The seasonal amplitude of the unemployment rate dropped from 27.6 per cent in 1976 to 20.6 per cent in 1984, and then rose to 24.1 per cent in 1990 before returning to a downward path, reaching 18.6 per cent in 1997. The MSV of the unemployment rate was 8.6 per cent in 1976, 6.3 per cent in 1984, 6.6 per cent in 1988-1989 and 5.2 per cent at the end the period.

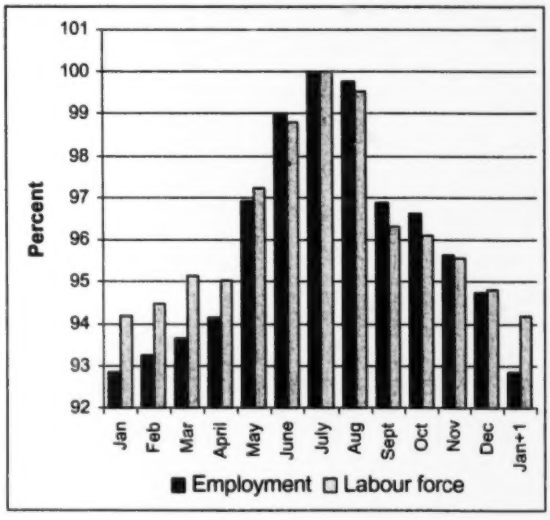
A breakdown of the data by province shows that seasonality in unemployment rate is not much higher to the east of Quebec than to the west, with the exception of PEI, where estimates are based on very small samples. Sections 2 and 3 showed that both employment and labour force seasonality were noticeably higher in the Atlantic Provinces than elsewhere in Canada. This is a result of the tendency for the labour force to follow employment in all regions. The consequence of this is that seasonality in the unemployment rate does not vary greatly by region. Other factors that can account for this pattern and discussed in sub-section 4.2.

There is considerable seasonal volatility in the unemployment rate that is not informative about the seasonal under utilisation of labour. However, it is possible to estimate the impact that seasonality has on the unemployment rate, by making modifications that abstract from the monthly fluctuations of the labour force and unemployment. Such estimation is presented in sub-section 4.2.

## 4.2 What would the unemployment rate be if there were no seasonality?

As noted earlier, the labour force and employment have very similar seasonal profiles (figure 4.3). Yet the gap between employment and the labour force is seasonal and it is this gap that gives the unemployment rate it's seasonal characteristic. This means that unemployment is relatively high in winter and lower in summer or in autumn. Yet, as can be seen from figure 4.3, the rise in unemployment during winter is relatively small compared with the decline in the labour force. Thus, the seasonal decline in employment after the seasonal peak is only partially reflected in the unemployment rate.

Figure 4.3
**Employment and labour force by month**
Canada, average, 1976-1997
(Month of July average = 100; trend eliminated)




Still, it is interesting to know what proportion of the unemployment rate is a result of seasonality. Using annual averages is one means of removing the effects of seasonality. For example, the annual average of employment can be viewed as a measure of employment, were there no seasonality in production. In effect, annualising employment assumes that production is evenly spread over the entire year. As a consequence, the annual unemployment rate already excludes the impact of seasonality in employment. However, the annual unemployment rate still incorporates the impact of differences in the seasonal fluctuations of the labour force from

employment, averaged over the entire year. To the extent that seasonally employed individuals do not withdraw from the labour force in the winter months, even though employment declines, the average annual unemployment rate will be higher.

A relatively simple method to obtain an estimated unemployment rate where seasonal patterns are removed is to consider the unemployment rate in the month where employment reaches its seasonal peak. Assuming that the labour force at this time contains no seasonally unemployed individuals, the unemployment rate at this point excludes seasonal unemployment. One means of calculating an annual unemployment rate that excludes the impact of seasonality is to hold this level of unemployment constant throughout the year and add it to employment to create a new labour force series. Averaging the monthly unemployment rate calculated in this way over the entire year results in an estimated annual unemployment rate that excludes seasonality. In simpler terms, this represents an annual unemployment rate assuming that the labour force declines in the same numbers as employment declines from its seasonal peak.

Figure 4.4
**Actual unemployment rate by month**
Canada, average, 1977-1997

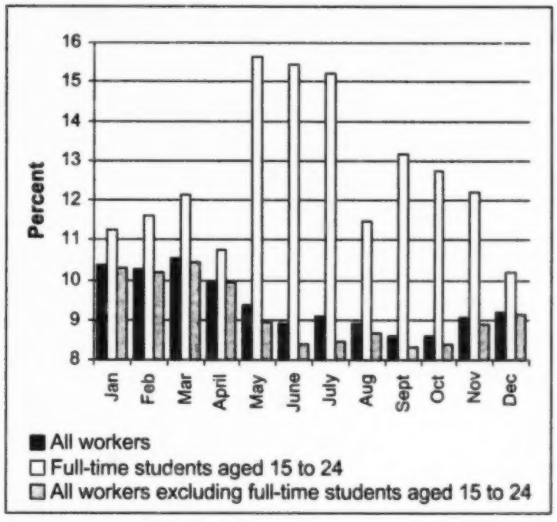
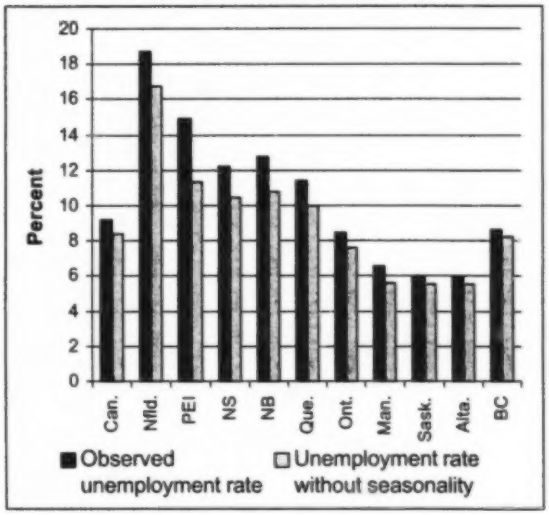



Figure 4.4 shows the monthly unemployment rate. For non-students, the unemployment rate reaches its annual low point during the months where employment is at its seasonal peak. However, figure 4.4 also indicates that the influx of students into the labour force in the summer, is not matched by a commensurate increase in employment. Consequently the unemployment rate for students actually reaches a peak during the summer months. The proposed methodology therefore does not provide meaningful results for students.

Figure 4.5 presents an estimate of the non-seasonal unemployment rate. For Canada, the difference between the adjusted and the actual unemployment rate is 0.8 of a percentage point. This means that differing seasonal behaviour of the labour force from employment does have a

noticeable impact on the overall unemployment rate. The methodology described to calculate the estimated non-seasonal unemployment rate has been applied excluding students, age 15-24 years. The adjusted unemployment rates are calculated independently in each province and for Canada as a whole. This is appropriate because the month when employment is at its annual maximum differs from one province to another, as well as the timing in the way labour force is following employment. In the provinces, the difference between the actual and adjusted unemployment rates is larger than one percentage point in five provinces: Prince-Edward-Island (3.5), New Brunswick (2.0), Newfoundland (2.0), Nova Scotia (1.8) and Quebec (1.4).

Figure 4.5
**Effect of seasonality on the unemployment rate**
Canada and provinces, 1997



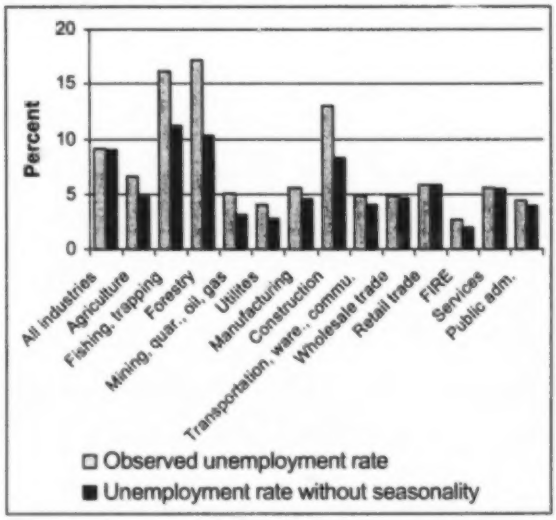

Note: The adjustment for seasonality is made only to non-students.

In the Atlantic Region, seasonal workers apparently are less likely to withdraw from the labour force in the off-season, at least relative to the available employment opportunities. This was also evident in the greater gap between the seasonal behaviour of the labour force and employment in this region, mentioned in Section 3. The finding that there are more seasonally unemployed looking for work in the Atlantic Region may reflect a lack of local opportunities in other sectors in the off-season. In other regions, there are fewer seasonal workers and more opportunities in other non-seasonal industries. EI program criteria, which mandate job search as a requirement for benefit eligibility, may also elevate unemployment in the off-season.

The seasonal unemployment rate gap varies significantly by broad industry group. Results by industry are presented in Figure 4.6. Unfortunately it was not possible to compute estimates by industry excluding students. While the seasonal unemployment rate gap is understated as a result, it is still substantial in particular industry groups. For instance, seasonal patterns account for 6.9 percentage points of the unemployment rate in logging and forestry, 5.0 percentage points in fishing and trapping, 4.7 percentage points in construction, 1.9 percentage points in mining, and

1.7 percentage points in agriculture. However, as the industries with the largest unemployment rate gap account for a relatively small share of total employment, their impact on the national unemployment rate is small. In the service sector, the labour force follows employment much more closely, hence there is little gap between the actual and the adjusted unemployment rates. The gap is always lower than one percentage point, except in the utilities sector, where it is 1.4 percentage point.

Figure 4.6
**Effect of seasonality on the unemployment rate**
Canadian industries, 1997




Note: The adjustment for seasonality is made to the entire labour force including students.

According to the results in Figure 4.6, there is therefore significant unemployment in primary sector industries due to a tendency of individuals not to withdraw from the labour force as employment declines in the off-season. As was the case in the Atlantic Region, some workers in primary-sector industries may not be able to find employment in other industries in the off-season. Similarly, EI program criteria that require job search may also elevate unemployment in the off-season in seasonal industries.

# 5. Conclusions

The purpose of the analysis is to improve our understanding of seasonality in labour market aggregates and their impact on the functioning of the labour market, the unemployment rate, and on the under utilisation of labour. The paper examines trends in seasonality and makes comparisons with the United States and among Canadian provinces.

The paper analyses seasonality in the labour market by comparing raw and seasonally adjusted data. A number of estimates of seasonality are computed using data taken from the Labour Force Survey. Amplitude seasonality is computed by dividing the actual by seasonally adjusted estimates and by taking the difference between the annual maximum and minimum values. The mean seasonal variation is the annual average of the absolute difference between the ratio of unadjusted to seasonal adjusted estimates in percentage and 100 per cent. The peak-trough measure is the excess of the peak 2-month average level relative to the lowest 2-month average for the same year, using seasonally unadjusted data.

These three measures of seasonality represent several aspects of it and are intended to measure mainly two different concepts. For instance, amplitude seasonality and the peak-trough measures give information on the size of seasonal swings of a time series within a year although the peak-trough measure includes the effect of the upward trend. The mean seasonal variation shows to what extent the seasonal swings are spread throughout the year.

While there are some differences among the concepts and estimates of seasonality, which matter in the interpretation of the data, the results themselves show a significant degree of similarity in the ranking and direction of estimates. For this reason, the remaining conclusions will focus on seasonality in general rather than on the type of measure that is used to detect it. For example, regardless of the measure used, it is clear that the Atlantic provinces show more seasonality in their labour market aggregates than the other provinces. The same is true concerning industrial groups. The primary sector and the construction industry are more seasonal than other sectors of the economy. However, employment seasonality is widespread across industrial sectors and it is

not limited to those sectors that are traditionally viewed as seasonal. For instance, public administration shows a noticeable seasonal pattern, as does retail trade.

Employment seasonality in Canada is about twice as high as in the United States. However, it has declined significantly in both countries at approximately the same rate. Seasonal amplitude was 2.2 times as high in Canada as in United States in 1976 and 2.1 in 1997. Given the greater importance of seasonal employment in Canada, this means that the absolute decline in seasonality has been larger in Canada. Seasonal amplitude fell from 8.7 per cent in 1976 to 6.3 per cent in 1997, a decline of 2.4 percentages points. In United States, the decline was 1 percentage point over the period – from 4 per cent in 1976 to 3 per cent in 1997. The reduction in employment seasonality in both countries is due both to a decline in the share of highly seasonal industries, such as primary industries and construction, in total employment as well as to changes that have reduced seasonal employment fluctuations in these seasonal industries. For Canada, both effects contributed almost equally to the drop in seasonality between 1976 and 1997.

The timing of seasonal swings in employment is similar across regions in Canada – what differs is the magnitude of seasonal employment fluctuations. Employment is much more seasonal in the Atlantic Provinces than in the rest of Canada. For example, while the seasonal amplitude of employment was 7.6 per cent in Canada on average over 1976-1997, it was 23.3 per cent in Newfoundland, 23 per cent in Prince-Edward Island, 16.4 per cent in New Brunswick, and 11.8 per cent in Nova Scotia. Higher employment seasonality appears to be principally attributable to greater seasonal fluctuations in employment in all broad industry groups in Atlantic Canada, rather than because of differences in the industry mix of employment. However, this conclusion is tentative, given that it is based on a highly aggregated analysis. Greater seasonality of broad industry sectors may in part reflects differences in the make-up of broad industrial groups in the Atlantic region - a precise estimate will require more detailed analysis.

The labour force also shows seasonal patterns that are similar to those of employment. The high correlation between seasonal movements in the labour force and employment, both nationally and across provinces, indicates that non-employed individuals tend to withdraw from the labour force during the off-season. However, the seasonal swings are somewhat smaller in the labour force

than in employment, with the result that unemployment rises somewhat in periods of seasonally low employment. For instance, employment in Canada is, on average in January, at 92.9 per cent of its July value over the period 1976-1997 if we exclude the trend, compared to 94.2 per cent for the labour force.

Seasonal fluctuations in the unemployment rate reflect both seasonal movements in employment and in the labour force. The difference in the seasonal patterns of employment and the labour force has a strong influence on the monthly unemployment rate, which is very sensitive to slight departures of the labour force from the seasonal pattern of employment. The impact on the unemployment rate of the tendency for seasonal workers not to leave the labour force added 0.8 of a percentage point to the national unemployment rate in 1997. Moreover, the effect of seasonality on the unemployment rate is much larger in particular industries and individual provinces. For instance, seasonal patterns account for 6.9 percentage points of the unemployment rate in logging and forestry, 5.0 percentage points in fishing and trapping, 4.7 percentage points in construction, 1.9 percentage points in mining, and 1.7 percentage points in agriculture. In the other industries, this effect generally represents less than 1 percentage point. The effects on the provincial unemployment rates are 3.5 percentage points in Prince-Edward-Island, 2.0 in New Brunswick, 2.0 in Newfoundland, 1.8 in Nova Scotia and 1.4 percentage points in Quebec.

This study indicates that though the effect of seasonality is declining in Canada, seasonal employment patterns are significant in certain industries and regions of the country. While the labour force has apparently adapted to seasonal movements in employment, seasonal unemployment is noticeable at a national level. There are significant numbers of seasonally unemployed in primary sector industries and in Atlantic Canada. Consequently, seasonality remains an important policy challenge.

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